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THE  
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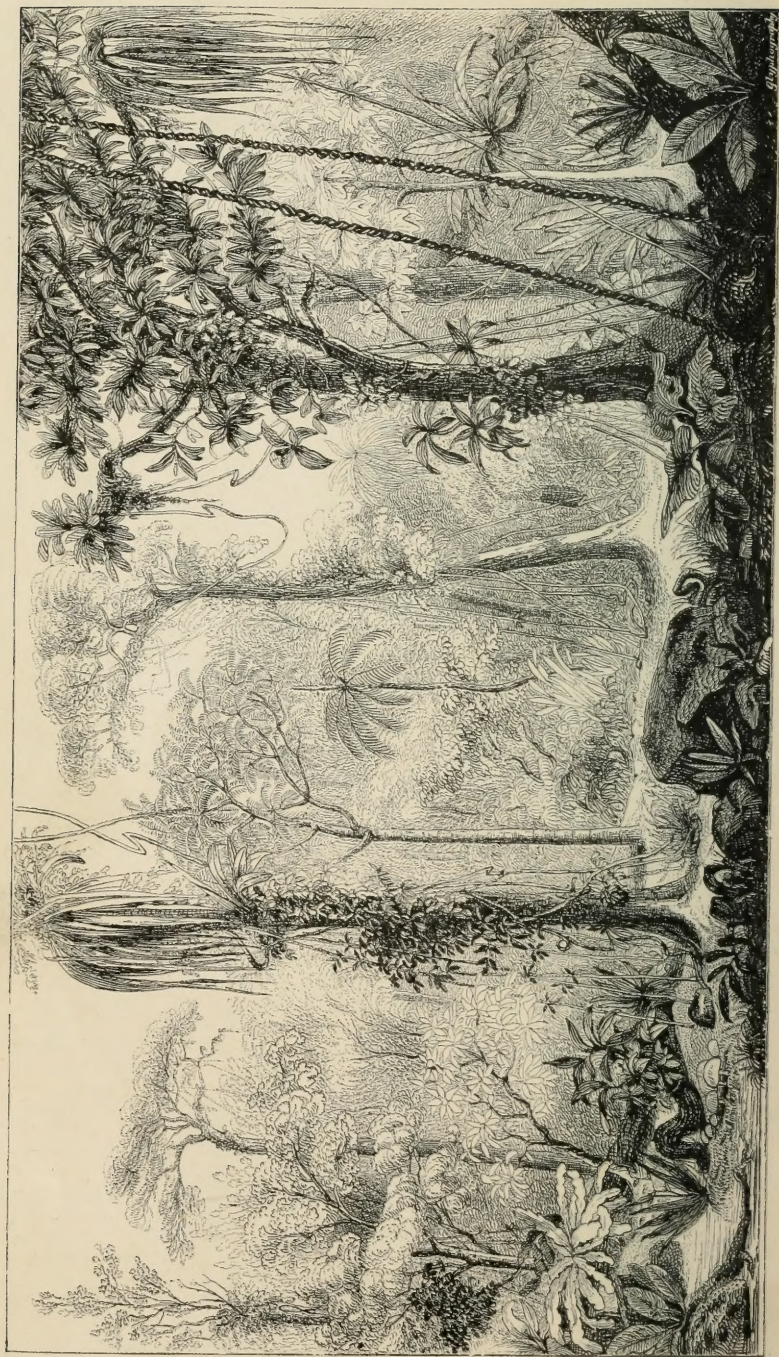














# THE VEGETABLE KINGDOM;

OR,

The Structure, Classification, and Uses of Plants,

ILLUSTRATED UPON THE NATURAL SYSTEM

BY

JOHN LINDLEY, PH. D. F.R.S. & L.S.

CORRESPONDING MEMBER OF THE INSTITUTE, PROFESSOR OF BOTANY IN THE UNIVERSITY OF LONDON.

Methodum intelligo naturæ convenientem quæ nec alienas species conjungit, nec cognatas separat."—*Rollé Salicetæ*, *part. f.* p. 15.

WITH UPWARDS OF FIVE HUNDRED ILLUSTRATIONS

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## PREFACE.

THIS work originated in a desire, on the part of the Author, to make his countrymen acquainted with the progress of Systematical Botany abroad, during the previous quarter of a century. When it first appeared, the science was so little studied that the very names of some of the best writers on the subject were unfamiliar to English ears. In our own language there was nothing whatever; and the Natural System of arranging plants, although occasionally mentioned as a something extremely interesting, was currently regarded as the fond speculation of a few men with more enthusiasm than sound judgment; and this, too, was the opinion expressed by persons who stood at the head of English Botany, in the estimation of many British Naturalists. The Author had himself severely experienced the want of some guide to this branch of Natural History, and he felt anxious to relieve others from the inconvenience which he had encountered; the more especially after he had undertaken the responsibility of filling the Botanical Chair in the then London University. At that time, too, there was nothing of foreign origin which could be advantageously consulted; for Bartling's *Ordines* had not reached England, Perleb's *Lehrbuch* was unknown, and both it and Agardh's *Classes* were of too slight a texture to be generally useful to any except Botanists themselves.

The importance of the Natural System in a practical country like Great Britain was too manifest to leave any doubt in the mind of the Author that the good sense of his countrymen would lead to its universal reception when once placed within their reach. Nor has he been disappointed. Fifteen years have sufficed to render the once popular, but superficial and useless, system of Linnæus a mere matter of history. *Exit Linnæus.*



The Natural System of Botany being founded on these principles, that all points of resemblance between the various parts, properties, and qualities of plants shall be taken into consideration; that thence an arrangement shall be deduced in which plants must be placed next each other which have the greatest degree of similarity in those respects; and that consequently the quality of an imperfectly known plant may be judged of by that of another which is well known, it must be obvious that such a method possesses great superiority over artificial systems, like that of Linnæus, in which there is no combination of ideas, but which are mere collections of isolated facts, having no distinct relation to each other. The advantages of the Natural System, in applying Botany to useful purposes, are immense, especially to medical men, who depend so much upon the vegetable kingdom for their remedial agents. A knowledge of the properties of one plant enables the practitioner to judge scientifically of the qualities of other plants naturally allied to it; and therefore, the physician acquainted with the Natural System of Botany, may direct his inquiries, when on foreign stations, not empirically, but upon fixed principles, into the qualities of the medicinal plants which have been provided in every region for the alleviation of the maladies peculiar to it. He is thus enabled to read the hidden characters with which Nature has labelled all the hosts of species that spring from her teeming bosom. Every one of these bears inscribed upon it the uses to which it may be applied, the dangers to be apprehended from it, or the virtues with which it has been endowed. The language in which they are written is not indeed human; it is in the living hieroglyphics of the Almighty, which the skill of man is permitted to interpret. The key to their meaning lies enveloped in the folds of the Natural System, and is to be found in no other place.

The great obstacle to the adoption of the Natural System of Botany in this country was the supposed difficulty of mastering its details; but of that difficulty it may be observed, in the first place, that it is only such as it is always necessary to encounter in all branches of human knowledge; and secondly, that it has been much exaggerated by persons who have written upon the subject without understanding it.

It has been pretended that the characters of the Natural classes of plants are not to be ascertained without much laborious research; and that not a step can be taken until this preliminary difficulty



is overcome. But it is hardly necessary to say, that in natural history many facts which have been originally discovered by minute and laborious research, are subsequently ascertained to be connected with other facts of a more obvious nature: and of this Botany offers perhaps the most striking proof that can be adduced. One of the first questions to be determined by a student of Botany, who wishes to inform himself of the name, affinities, and uses of a plant, seems to be, whether it contains spiral vessels or not, because some of the great divisions of the vegetable kingdom are characterised by the presence or absence of those minute organs. It is true that careful observation, and multiplied microscopical analyses, have taught Botanists that certain plants have spiral vessels, and others have none; but it is not true, that in practice so minute and difficult an inquiry needs to be instituted, because it has also been ascertained that plants which bear flowers have spiral vessels, and that such as have no flowers are usually destitute of spiral vessels, properly so called; so that the inquiry of the student, instead of being directed in the first instance to an obscure but highly curious microscopical fact, is at once arrested by the two most obvious peculiarities of the vegetable kingdom.

Then, again, among flowering plants two great divisions have been formed, the names of which, Monocotyledons and Dicotyledons, are derived from the former having usually but one lobe to the seed, and the latter two,—a structure much more difficult to ascertain than the presence or absence of spiral vessels. But no Botanist would proceed to dissect the seeds of a plant for the purpose of determining to which of those divisions it belongs, except in some very special case. He knows from experience that the minute organisation of the seed corresponds with a peculiar structure of the stem, leaves, and flowers, the most highly developed, and most easily examined parts of vegetation; a Botanist, therefore, prefers to examine the stem, the flower, or the leaf of a plant, in order to determine whether it is a Monocotyledon or a Dicotyledon, and rarely finds it necessary to anatomise the seed.

The presence or absence of albumen, the structure of the embryo, the position of the seeds or ovules, the nature of the fruit, the modifications of the flower, are not to be brought forward as other difficult points peculiar to the study of the Natural System, because, whatever system is followed, the student must make himself acquainted with such facts, for the purpose of determining genera. The common Tead-flax cannot be discovered by its



characters in any book of Botany, without the greater part of this kind of inquiry being gone through.

In the determination of genera, however, facility is entirely on the side of the Natural System. Jussieu has well remarked "that whatever trouble is experienced in remembering, or applying the characters of Natural Orders, is more than compensated for by the facility of determining genera, the characters of which are simple in proportion as those of Orders are complicated. The reverse takes place in arbitrary arrangements, where the distinctions of classes and sections are extremely simple and easy to remember, while those of genera are in proportion numerous and complicated."

But really all considerations of difficulty ought to be put aside when it is remembered how much more satisfactory are the results to which we are brought by the study of Nature philosophically, than those which can possibly be derived from the most ingenious empirical mode of investigation.

Such were the motives which led to the publication, in 1830, of the first edition of the present work, under the name of an *Introduction to the Natural System of Botany*. No one would have more readily than the Author transferred the labour to another hand, if any other had been found. Indeed, he confesses that it was because the most capable of those whom he knew belonged to the class of men described by Lord Bacon, who "object too much, consult too long, adventure too little, repent too soon, and seldom drive business home," that he undertook a task for which no man's abilities are in reality high enough. He could not but feel that: "To think nothing done while anything remains to be done is a good rule for perseverance, but to think that nothing should be done while a main thing remains undone, would be a most idle and thriftless maxim. If there be a good presently practicable, it may be done without any desertion of another good not so immediately attainable. And in effecting all secondary amendments, we have the satisfaction of feeling assured that there is a link between all real improvements, and that every sound reform is a step to others, though the connexion may not be broadly distinguishable."

The *Introduction to the Natural System* was originally written in illustration of the popular system of De Candolle; but daily experience showed the insufficiency of that system, and the necessity of forming sub-divisions of the primary groups of plants higher than their so-called Natural Orders became so apparent, as



to lead to serious attempts to carry out a plan of Alliance, in imitation of a few continental writers. These attempts were embodied in the second edition of the present work, which appeared in 1836, under the name of *A Natural System of Botany*. Notwithstanding some glaring defects in the method then proposed, and a host of errors of a less manifest description, the views of the Author were favourably received by those best able to judge of their value. On the other hand, they have been severely criticised by writers who show a singular want of knowledge of the true bearing of such works. Those persons have imagined that a natural classification of plants is something which is suddenly to start into existence, perfect in all its parts, and their criticisms betray a total ignorance of the difficulties by which such a subject is surrounded. The *Natural System of Botany* may be likened to the plan of a vast edifice, at the construction of which many are labouring. Certain courts and quadrangles are easily set out; a particular style of architecture is agreed upon, and it may be even settled irrevocably in what places the state apartments and cellars are to be stationed. But when further details are to be discussed, many unsatisfactory attempts must be made by the architects, and many an awkward arrangement of the rooms proposed, before a final plan can be produced. If perfection in such small matters is impracticable, if it is impossible so to arrange all the details of even an edifice as to satisfy all critics, how much more hopeless must be the task of classifying the infinite works of the creation! To demand perfection in a work of that nature is little less than impious; for perfection is the attribute, not of man, but of his Maker.

The Author may now be equally charged with inconsistency in not adhering to his former plan of classification after having promulgated it. But he is not conscious of having ever pretended that it even approached permanency.—See *Natural System*, p. xlv. In fact, there is no such thing as stability in those matters. Consistency is but another name for obstinacy. All things are undergoing incessant change. Every science is in a state of progression, and of all others the sciences of observation must so. Since 1836 the views of the Author have, of course, been altered in some respects, although they have experienced but little modification in others. This is inevitable in such a science as that of Systematic Botany, where the discovery of a few new facts or half a dozen fresh genera may instantly change the point of view from which a given object is observed. The Author cannot



regard perseverance in error commendable, for the sake of what is idly called consistency; he would rather see false views corrected as the proof of their error arises. His object, and, he thinks he may say that of every one else who has turned his attention to this question of late, has not been to establish a system of his own, which shall be immutable, but to contribute to the extent of his ability towards that end. He indeed must be a very presumptuous person, having a microscopically small acquaintance with his subject, who should even dream of being able to accomplish such a purpose. All that we can do is to throw our pebbles upon the heap, which shall hereafter, when they have sufficiently accumulated, become the landmark of Systematical Botany.

Having stated thus much by way of preface, it only now remains to explain the plan of the work in its new form. Its object is to give a concise view of the state of Systematical Botany at the present day, to show the relation or supposed relation of one group of plants to another, to explain their geographical distribution, and to point out the various uses to which the species are applied in different countries. The names of all known genera, with their synonyms, are given under each Natural Order, the numbers of the genera and species are in every case computed from what seems to be the best authority, and complete Indices of the multitudes of names embodied in the work are added, so as to enable a Botanist to know immediately under what Natural Order a given genus is stationed, or what the uses are to which any species has been applied. Finally, the work is copiously illustrated by wood and glyphographic cuts, and for the convenience of Students, an artificial analysis of the system is placed at the end. Some of these points demand a few words of comment.

In offering to the public a view of the present state of Systematical Botany, the Author has pursued the plan developed in the succeeding pages, of first taking certain characters common to very extensive assemblages of plants, by means of which Classes have been constituted; and, secondly, of breaking up those Classes into minor groups called Alliances, whose common characters are also more extensive than those of Natural Orders, and under which the Natural Orders are themselves assembled. Very short characters have been proposed, under the name of Diagnoses, for both Alliances and Orders; these are intended to express the prevailing tendency observable in each group, but do not include casual exceptions, for which the reader is referred to the descriptions immediately



following the Diagnosis. The Alliances are the most important feature in the arrangement; and it is to be hoped will be found much better limited than they formerly were. The serious fault committed in the Author's former work, of founding Alliances upon single Natural Orders, has been avoided in every case except that of Palms, which in reality seem to form an Alliance by themselves. The name Alliance has been preserved in preference to that of class, family, circle, cohort, &c., because it is not susceptible of two interpretations, as is the case with all the others; it is employed as an English equivalent for the Latin term *unus*, which some have imagined was a misprint for *unus*, but which was used in the sense of Cicero, and intended to express a tendency to assume some particular form of structure. If any one should inquire why no synonyms have been quoted to these Alliances, concerning which so many Botanists have lately occupied themselves, the Author's answer is, that they have hitherto been much too little agreed upon, except in a few very special cases, and that an examination of their history would involve an inquiry which must extend back to the Anthemides of Ciesalpinus, and which belongs to the history of Systematical Botany rather than to its actual condition. The whole practice, indeed, of quoting synonyms is carried by Botanists beyond useful limits. It is in many cases a matter of courtesy rather than of utility; and for this reason, as no one is bound to be courteous to himself, the Author has very generally refrained from making references to his own writings, except when some real necessity for doing so appeared to exist. He may also state in this place, that throughout the present work he has struck out many of the citations given in the last edition, conceiving it useless again to occupy space with the names of authorities which can be always found by those who are desirous to search for them.

In pointing out the affinities of plants the opinions of the most judicious systematists have been consulted; among these the names of Arnott, Auguste de St. Hilaire, Bennett, Bentham, Ad. Brongniart, Brown, Cambessédès, Decaisne, the De Candolles, Endlicher, the Hookers, the Jussieus, Martius, Miers, and Richard, stand in the first rank. In addition to the short discussion upon this subject which always follows the paragraph descriptive of a Natural Order there is appended to the list of genera a plan of indicating affinity now adopted for the first time. It consists of printing the name of the Order under discussion in capital letters; placing right



and left of it in small Roman letters the names of those Orders which are supposed to be in nearest alliance to it; and above and below it in italic type the names of such as are only analogous, or at least have a more distant affinity. The idea of this is borrowed from Mr. Strickland's excellent paper on the true method of discovering the Natural System in Zoology and Botany, printed in the *Annals of Natural History*, vol. vi. p. 184.

The uses to which plants are applied has been re-examined with great care, and principally re-written. This part was originally intended as a mere sketch of so vast and important a subject, and in truth it is little more even now. It is, however, materially enlarged, and the Author hopes better arranged. In preparing it great numbers of works have been consulted, and most especially the special treatises of Dierbach, Fée, Geiger, Guibourt, Martius, Nees v. Esenbeck, Pereira, Richard, and Royle, together with the capital condensation published by Endlicher in his *Enchiridion*. The Author was also strongly advised by one whose opinion has great weight with him, to introduce among the properties of plants an account of their proximate principles and ultimate constituents. But after a full consideration of the subject, he has come to the conclusion that it is not expedient to do so. In the first place, such matters belong to Chemistry, and not to Botany; secondly, it does not appear possible to connect them with any known principle of botanical classification; and, moreover, the extremely unsteady condition of the opinions of chemists themselves upon the result of their own researches, and the uncertainty at present connected with the details of organic chemistry, would render the introduction of the supposed results of chemists embarrassing rather than advantageous. If it is true, as appears to be admitted, that such principles as Caffeine and Theine are identical, and that oils of Anise and Tarragon are chemically undistinguishable, it is clear that these substances can have no connexion with structure, or Botanical classification, if indeed they are not altogether artificial products produced by chemical processes, like Dr. Fownes's furfurol—a vegeto-alkali resulting from the distillation of bran, sulphuric acid, and water.

In forming the lists of genera, the Author is called upon to acknowledge the great assistance that he has derived from those of Professor Endlicher, which indeed he has ventured to take as the foundation of his own, making however considerable additions and material changes in some, and entirely re-writing others;



in which troublesome but necessary task he has been most essentially assisted by the Rev. M. J. Berkeley, who furnished the list of Fungals, and by Mr. Bentham, to whom he is indebted for those of Leguminous and Labiate plants and of Figworts. The reader will perceive that according to the custom of Botanists the names of genera which the Author adopts, are printed in Roman letters, and succeeded by others indented and printed in italics. The latter are either synonyms, or subgenera which do not at present appear to be of importance enough to be regarded as true genera.

In computing the number of species, attention has been paid not only to published statements, but also to such appearances of undescribed species as the Author's own herbarium indicates, assisted occasionally by a little guess-work, where Natural Orders have not been recently examined with care, or where species have been notoriously founded upon trifling and unimportant characters. He does not however doubt that the numbers are in all cases too low. All they pretend to is as near an approach to truth as, under existing circumstances, is possible.

The illustrations are partly original, partly derived from other authorities. It would have been more useful if a larger number could have been introduced; but costly embellishments are not possible beyond a certain limit. Should the present work be favourably received, others may be inserted hereafter in the numerous blanks that have been left among the pages.

Finally, the artificial analysis of Orders given in former editions has again been improved, and is now adapted to the volume in its new dress. It is, however, no longer placed at the beginning of the work, but will be found immediately before the indices. It has been gratifying to the Author to know that this table is habitually consulted by some of the most experienced Botanists.

There is still another point in which the Author has endeavoured to effect some improvement, and that is the nomenclature. Since the days of Linnaeus, who was the great reformer of this part of Natural History, a host of strange names, inharmonious, sesquipedalian, or barbarous, have found their way into Botany, and by the stern but almost indispensable laws of priority are retained there. It is full time, indeed, that some stop should be put to this torrent of savage sounds, when we find such words as *Caluccellinus*, *Oresigenesa*, *Finaustrina*, *Krascheminikovia*, *Gravenhorstia*, *Andræjofskyia*, *Mielichoferia*, *Monaetincirma*, *Pleuroschismatypus*, and hundreds of others like them, thrust into the records of Botany without



even an apology. If such intolerable words are to be used, they should surely be reserved for plants as repulsive as themselves, and instead of libelling races so fair as flowers, or noble as trees, they ought to be confined to Slimes, Mildews, Blights, and Toadstools. The Author has been anxious to do something towards alleviating this grievous evil, which at least need not be permitted to eat into the healthy form of Botany clothed in the English language.

No one who has had experience in the progress of Botany, as a science, can doubt that it has been more impeded in this country by the repulsive appearance of the names which it employs than by any other cause whatever; and that, in fact, this circumstance has proved an invincible obstacle to its becoming the serious occupation of those who are unacquainted with the learned languages, or who, being acquainted with them, are fastidious about euphony, and Greek or Latin purity. So strongly has the Author become impressed with the truth of this view, that on several occasions he has endeavoured to substitute English names for the Latin or Greek compounds by which the genera of plants are distinguished. Upon turning over the late volumes of the *Botanical Register* many such instances will be found, in imitation of the well-known and usual English words, Houndstongue, Loosestrife, Bugloss, Soapwort, Harebell, &c. He cannot, however, boast of any success in these feeble attempts at reforming a great evil; nor, perhaps, ought he to have expected it. If such English names are not universally adopted, it is to be suspected that the circumstance is traceable to the indifference of the public to partial and inconsiderable changes, which are unseen in the ocean of Botanical nomenclature. That they are important must be admitted; that the person most careless as to the difficulties of articulation would prefer to speak of a Fringe-Myrtle rather than of a Chamælaucium, or of a Gritberry than of a Comarostaphylis, will probably be allowed on all hands; and therefore the Author does not confess discouragement at failure; but would rather invite suggestions as to more probable means of success. Mere translation is neither necessary nor desirable in all cases. Many Latin names have, from custom, been adopted into the English language, and no wisdom would be shown in attempting to alter such words as Dahlia, Crocus, Ixia, or even Orchis. Others again are so easily sounded, and so much in harmony with the English tongue, that nothing could be gained



by interfering with them; such as *Peasea*, *Hugonia*, *Parkia*, *Mimosa*, *Arbutus*, &c. And, finally, there is a large class of scientific words which are best Englished by an alteration of their foreign terminations; for example, *Melanthium* may be changed to *Melanth*; *Desmanthus* to *Desmanth*; *Lecythis* to *Leecyth*; *Myrospermum* to *Myrosperm*; and such an alteration would at once possess the great advantage of rendering English plural terminations possible. *Melanthiums*, *Desmanthuses*, *Leecythises*, &c., sound offensively to classical ears; *Melanthia*, *Desmanthi*, *Leecythides*, are, if not pedantic, at least beyond the skill of uneducated readers; but *Desmanths*, *Melanths*, and *Leecyths*, are formed by the ordinary English plural termination without difficulty.

It is, however, to be feared that a long time will elapse before these views are carried out in such a manner as to insure their adoption. But in the meanwhile a commencement of the plan is practicable, and the Author hopes it will meet with support. The names by which the great groups of plants are known are few in number, and very often in use. There is certainly no reason why we should not at once English them; the practice, indeed, is already adopted to some extent by the substitution of the words *Monocotyledons*, *Dicotyledons*, *Exogens*, *Endogens*, *Cryptogams*, *Phænogams*, &c., for *Monocotyledones*, *Dicotyledones*, *Exogenæ*, *Endogenæ*, *Cryptogamæ*, *Phænogamæ*, &c. It is even carried further by speaking of *Rosaceous* plants instead of *Rosaceæ*, *Orchidaceous* or *Orchideous* plants instead of *Orchidaceæ*, or *Orchideæ*, &c. But these amended names are still too long, and too un-English in sound to be in favour with the world which lies without the narrow circle of mere systematists; and no valid reason seems to exist for not immediately reforming that part of the nomenclature of Botany. The attempt has been already made in the Author's *School Botany*, where it will be found that by availing himself of well-known English names, or of the English word "wort," or by merely remodelling the terminations, a uniform English nomenclature has been secured for all the common European Natural Orders of plants. Thus for *Nymphæaceæ*, *Ranunculaceæ*, *Tamaricaceæ*, *Zygophyllaceæ*, *Elatinaceæ*, are substituted *Water-Lilies*, *Crowfoots*, *Tamarisks*, *Bean-Capers*, and *Water-Peppers*; for *Malvaceæ*, *Amaranthiaceæ*, *Gentianaceæ*, *Primulaceæ*, *Urticaceæ*, *Euphorbiaceæ*, are employed *Mallow-worts*, *Citronworts*, *Gentianworts*, *Primworts*, *Nettleworts*, *Spurge-worts*; and the terms *Orchids*, *Hippurids*, *Amaryllids*, *Irids*, *Typhads*, *Arads*, *Cueurbits*, are taken as English equivalents for *Orchi-*



daceæ, Haloragaceæ, Amaryllidaceæ, Iridaceæ, Typhaceæ, Araceæ, and Cucurbitaceæ. The principles kept in view in effecting those changes have been also observed throughout the present work, so that standard English names for Classes and Orders are now no longer wanting. The Author confidently believes that every intelligent reader will admit that such names as *Urn-mosses*, *Taccads*, *False Hemps*, *Pepperworts*, *Bristleworts*, *Chenopods*, *Hydrocharads*, *Scale-mosses*, *Birthworts*, and *Fringe-Myrtles* are preferable to *Bry-a-ce-æ*, *Tac-ca-ce-æ*, *Da-tis-ca-ce-æ*, *El-a-ti-na-ce-æ*, *Che-no-po-di-a-ce-æ*, *Des-vaux-i-a-ce-æ*, *Hy-dro-cha-ri-da-ce-æ*, *Jun-ger-man-ni-a-ce-æ*, *A-ris-to-lo-chi-a-ce-æ*, *Cha-mæ-lau-ci-a-ce-æ*, and other sesquipedalian expressions.

UNIVERSITY COLLEGE, LONDON.

*October, 1845.*

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NOTE TO THE THIRD EDITION.—In the present Edition the reader will find much new matter, and a considerable number of new woodcuts. Many of the former illustrations have been replaced by better ones. The lists of genera have been completed up to the day on which each sheet was sent to press, as far as the materials at the command of the author permitted, and the whole of such additions have been indexed. Few changes have been made in the computed number of genera and species under each natural order, because, in the present very unsatisfactory state of systematical Botany, when a writer of no mean station converts one true species into three false genera and twenty false species, it seems hopeless to arrive at a much nearer approach to the truth than was attained in 1845. Many kind friends have again assisted the author in his task, and his most grateful general thanks are due to them, in addition to those separate acknowledgments which appear wherever new matter has been contributed.

*July 21, 1853.*



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## INTRODUCTION.

THAT part of the material world which bears the name of the Vegetable Kingdom, consists, like the Animal, of a vast multitude of species, whose outer and inner forms alike offer a prodigious diversity of modifications of one common simple plan of structure. Organic vesicles, usually extending into tubes of various kinds, exclusively constitute what we call Vegetation ; but this simplicity of nature is attended by very complex details of arrangement, as is shown in trees, whose framework is knit together by countless myriads of such vesicles and tubes, entangled with an astonishing intricacy of simple arrangement.

Any living combination whatsoever of such vesicles constitutes a plant ; but as the combinations themselves are countless, so are the resulting external forms : for, although two or three words may suffice to express all combinations whatsoever in their most general sense, as when the name of thallus is given to the simplest expansion of vegetable matter, while all the more complex forms are included under the name of axis and its appendages, yet ingenuity is exhausted in the attempt to distinguish by appropriate terms the manifold external forms assumed by that axis and the parts which it bears.

Hence it is that wherever the eye is directed it encounters an infinite multitude of the most dissimilar forms of vegetation. Some are cast ashore by the ocean in the form of leathery straps or thongs, or are collected into pelagic meadows of vast extent ; others crawl over mines and illuminate them with phosphorescent gleams. Rivers and tranquil waters teem with green filaments, mud throws up its gelatinous scum, the human lungs, ulcers, and sordes of all sorts bring forth a living brood, timber crumbles to dust beneath insidious spawn, corn crops change to fetid soot, all matter in decay is seen to teem with mouldy life ; and those filaments, that *semi*-brod spawn and mould, alike acknowledge a vegetable origin. The bark of ancient trees is carpeted with velvet, their branches are hung with a grey-beard tapestry, and microscopical scales overspread their leaves ; the face of rocks is stained with ancient colours, coeval with their own exposure to air ; and those too are citizens of the great world of plants. Heaths and moors wave with a tough and wiry herbage, meadows are clothed with an emerald mantle, amidst which spring flowers of all hues and forms, bushes throw abroad their many-fashioned foliage, twiners scramble over and choke them, above all wave the arms of the ancient forest, and these too acknowledge the sovereignty of Flora. Their individual forms too change at every



step. With every altered condition and circumstance new plants start up. The mountain side has its own races of vegetable inhabitants, and the valleys have theirs; the tribes of the sand, the granite, and the limestone are all different; and the sun does not shine upon two degrees on the surface of this globe the vegetation of which is identical: for every latitude has a Flora of its own. In short, the forms of seas, lakes, and rivers, islands and peninsulas, hills, valleys, plains, and mountains, are not so infinitely diversified as that of the vegetation which adorns them.\*

Botanists have gathered together these endless forms, have studied and arranged them, and calculated their numbers, which amount to more than 92,000 species: a mighty host whose ranks are daily swelled by new recruits.

This vast assemblage has not been gathered together in a few years; it is coeval with man, and we cannot but feel that the study of the distinctions between one plant and another commenced with the first day of the creation of the human race. The name indeed of Botany is modern; but its antiquity dates from the appearance of our first parents. We may assume it as a certain fact that the Vegetable Kingdom was the first to engage the attention of man, for it was more accessible, more easily turned to useful purposes, and more directly in contact with him than the Animal. Plants must have yielded man his earliest food, his first built habitation; his utensils and his weapons must alike have been derived from the same source. This could not fail to produce experience, and especially the art of distinguishing one kind of plant from another, if it were only as a means of recognising the useful and the worthless species, or of remembering those in which such qualities were most predominant. This would involve from the very beginning the contrivance of names for plants, together with the collection of individuals into species; and the mental process by which this was unconsciously effected gradually ripened into the first rude classifications that we know of. By placing together individuals identical in form and the uses they could be applied to, species were distinguished; and by applying a similar process to the species themselves, groups analogous to what we now call genera were obtained. The last step was to constitute classes, which were recognised under the well-known names of "grass, and herbs yielding seed, and fruit trees yielding fruit."

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\* It is in the tropics that the prodigious diversity of appearance among plants is most strikingly exemplified. The beautiful forest scene, given as a frontispiece to this work, is copied from a plate in the *Flora Brasiliensis* of Dr. Von Martius, who describes it thus: "The landscape is divided into two unequal parts by a tree rising to the height of 70 or 80 feet; it is *Eschweilera angustifolia*. It is over-run with ropes which cling around it, or hang down in various festoons; these ropes yield a milky white or yellowish juice when wounded, and probably belong to the Dogbanes or *Asclepiads*; other twines, decorated with fine, large, beautifully green leaves, consist of species of *Banisteria*, *Smilax*, *Sargium* and *Bignonia*, voluptuously intertwined and entangled. A little above there is a tuft of the large leaves of *Antheurium glaucum*, and from the summit of all hangs down some unknown kind of Bromeliad. On the left stands a slender *Acacia*, whose bark is embraced by some parasitical climber; then comes the *Conrattia lewisii*, a high tree, whose timber is used in house-building; it forms a stem 60 or 70 feet high without a branch, and then spreads into a hemispherical head: owing to the slowness of its growth it is over-run with epiphytes. In front of the *Acacia* is a low tree with a close head and a shining bark: that is a *Freus americana*, and *Banisterias* are shooting downwards from among its branches. Here are also the boxes of some fallen giant of the forest, overspread with great tufts of *Antheurium* and *Epiphyllum phyllanthus*. Close by, some *Psychotria* expands its large leaves and wide branches. A *Heliconia* and a *Phrynium* start from the mud and marshy foreground; a great patch of *Antheurium umbellatum* flourishes on the rotten trunk, and just in front is a group of *Agarics*, such as we see in the woods of Europe. The tall tree on the right of *Eschweillera*, with a smooth bark and serrated leaves, is an *Inga*; next it is a small bush of *Leandra scabra*, behind which is a thicket of *Tabernaemontana* and *Renealmia nutans*, backed by the *Eriodendron leiantherum*. The beautiful Palm to the right of them is *Geonoma Feldiana*. The foreground on the right is occupied by *Ficus longifolia*, conspicuous with its ample foliage, and loaded with epiphytes of various kinds, especially with *Antheurium glaucum*, *umbellatum*, and *longifolium*, and *Caladium auritum*. These and different kinds of *Bilbergia* have also taken possession of the rotten trunks in the neighbourhood. Near these is the white-barked *Coccoloba polata*, with large green leaves lustrous with down on the under side." The cable-like climbers on the extreme right are not named by Dr. Von Martius.



But as human intelligence advanced, and a knowledge of things increased, such rude distinctions were improved, and when no means existed of appreciating the value of minute or hidden signs, the functions and existence of which were unknown, objects were at first collected into groups, characterized by common, external, and obvious signs. Theophrastus had his water-plants and parasites, pot-herbs and forest trees, and even plants; Dioscorides had aromatics, and gum-bearing plants, eatable vegetables and non-herbs; and the successive treatises, and copies of those writings, retained the same kind of arrangement for ages. It was not till 1570 that Lobel, a Fleming, improved the ancient modes of distinction, by taking into account characters of a more definite nature than those which had been employed by his predecessors; but he was soon outstripped by others, among the most distinguished of whom were Casalpini, an Italian who wrote in 1583, the celebrated Tournefort, and especially our countryman, John Ray, who flourished in the end of the seventeenth century. The latter added much to the knowledge of his predecessors, and had so clear and philosophical a conception of the true principles of classification, as to have left behind him in his *Historia Plantarum* the real foundation of all those modern views which, having been again brought forward at a more favourable time by Jussieu, are generally ascribed exclusively to that most learned botanist and his successors. Ray, however, laboured under the great disadvantage of being too far in advance of his contemporaries, who were unable to appreciate the importance of his views or the justness of his opinions; and who therefore, instead of occupying themselves with the improvement of his system, set themselves to work to discover some artificial method of arrangement, that should be to botany what the alphabet is to language, a key by which the details of the science may be readily ascertained. With this in view, Rivinus invented, in 1620, a system depending upon the formation of the corolla; Knebel, in 1693, upon the fruit alone; Magnol, in 1720, on the calyx and corolla; and finally, Linnæus, in 1731, on variations in the stamens and pistil. The method of the last author has enjoyed a degree of celebrity which has rarely fallen to the lot of human contrivances, chiefly on account of its clearness and simplicity; and in its day it afforded a large amount of good.

It was soon, however, perceived by those who studied the Vegetable Kingdom profoundly, that no improvement could be made in the knowledge of its true nature, of the best manner of arranging it, or even of the purposes to which it might be applied, unless the philosophy of the subject was investigated; and this became daily more apparent as the material collected by botanical travellers accumulated. It was found that the thousand ill-examined plants which inhabit Europe gave a most imperfect idea of the vegetation of the globe; that methods of classification which were tolerable so long as species were few, became useless, or at least unbecom- ing as the number increased, and that no real progress in botany, as a branch of science, could be hoped for so long as a few arbitrary signs were taken as the basis of all arrangement. The older botanists knew little of vegetable physiology; and of the laws of vegetable structure they had at the most but a glimmering perception. Yet these subjects are the foundation of all sound principles of classification. The recognition of that fact immediately led to the investigation of new branches of knowledge, in which discoveries were daily made, and it has terminated in a universal adoption of the principles of Ray, improved and extended by the admirable views of Jussieu, as developed in his *Genera Plantarum secundum Ordines*



*Naturales disposita*,—a book of wonderful sagacity and most profound research.

Since the appearance of that work Botany has assumed a new position in the ranks of science, and the evidence from which conclusions are to be drawn has multiplied beyond all that could have been anticipated. Twenty thousand species at the utmost could have been known to Jussieu in 1789; we have seen that the number actually on record at the present day amounts to more than 92,000. Vegetable Anatomy, the foundation of Vegetable Physiology, was at the former period in the state in which it had been left by Grew and Malpighi; it has since engaged the attention of the most acute and indefatigable observers, now armed with optical instruments of surprising excellence. The resources of Chemistry and Natural Philosophy have been enlisted in its cause; and the result is the accumulation of a prodigious mass of facts, the best mode of arranging which is the great problem that modern science has to solve.

That no artificial mode of classifying the vast materials of Botany could satisfy the human mind was clearly perceived and fully admitted by Linnæus himself, when he declared a Natural System to be the *primum et ultimum in botanicis desideratum* (Phil. Bot. § 77). That no insuperable obstacle to its attainment could exist in the nature of things became evident the moment that the work of Jussieu was before the world. That Botanist for the first time proposed distinctive characters for the groups of genera, which he called Natural Orders, and those characters were framed with such skill that a large proportion of his distinctions is still unaffected by the progress of modern discovery. The manner in which he obtained the distinctions of his Natural Orders was thus described by himself:—“*C'est ainsi que sont formées les familles très naturelles et généralement arouées. On extrait de tous les genres qui composent chacune d'elles les caractères communs à tous, sans excepter ceux qui n'appartiennent pas à la fructification, et la réunion de ces caractères communs constitue celui de la famille. Plus les ressemblances sont nombreuses, plus les familles sont naturelles, et par suite le caractère général est plus chargé. En procédant ainsi, on parvient plus sûrement au but principal de la Science, qui est, non de nommer une plante, mais de connoître sa nature et son organisation entière.*”

The Natural Orders thus obtained were bound together into a system by adopting the important distinctions of Acotyledons, Monocotyledons, and Dicotyledons, and then by subdividing the two latter into Classes mainly characterised by the insertion of the stamens or the condition of the corolla; as will be more particularly explained hereafter.

It was not, however, to be expected that the views of Jussieu should be just in all respects, or that his scanty materials would enable him to form a plan of classification sound and perfect in all its parts. On the contrary, his system abounded in errors and imperfections, and, in fact, the latter years of his life were occupied in striving to improve and consolidate it. The same object has been sought by great numbers of those who have succeeded him, and every few years of late have witnessed the production of some scheme of classification which, although founded essentially upon the groundwork of Jussieu, differed nevertheless in numerous details. In another place, the principal of these schemes will be mentioned. It will be for the present sufficient to say that, beginning with Brown in 1810, and ending with Adolphe Brongniart in 1843, the mass of suggestions and improvements which has been collected renders comparatively easy the task of applying Jussieu's principles of classification to the vast multitudes of species now forming the Vegetable Kingdom.



The true principles of classification, however much they may have been amplified and refined upon, were in reality expressed by Ray, when he defined a Natural System to be that *which neither brings together dissimilar species, nor separates those which are nearly allied*. However much the words of this definition may have been varied, it still retains the very meaning given to it by its author. A *species*, said Jussieu, *consists of individuals very much alike in all their parts, and retaining their resemblances from generation to generation. Those species are to be associated which correspond in the greater number of their characters; but one constant is of more importance than several inconstant characters. On these two axioms hangs the whole principle of Natural classification.*—(*Genera Plantarum* Pref.) And then he proceeded to show how a group of species combined upon this principle forms a Genus, of Genera an Order, and of Orders a Class; the same rules of combination being observed throughout, with this difference only, that the larger the group the fewer the characters by which it is limited (*Quo generalior enim est plantarum ordinatio quælibet, eò paucioribus utitur signis definitivis*).

But it is far more easy to lay down principles than to put them in execution. The definition of Ray is perfect, but its application is surrounded with difficulty. The very first point to settle in attempting to carry out his views is by what rule the dissimilarity or alliance of species is to be determined. In fact, very different ideas of likeness or unlikeness are entertained by different observers. The common people can see no difference of moment between a Daphne, and a Cherry, and a Rhododendron, but call them all Laurels, although a Botanist fails to perceive their resemblance. On the other hand, there seems to the vulgar eye no connection between the Hemp plant and the Mulberry tree, and yet the Botanist brings them into close alliance. Nor are these conflicting views confined to the ignorant and the uneducated; such differences of opinion may be found among Botanists themselves. For instance, Linnaeus joined Arum with *Phytolacca* under his *Piperitæ*, and *Convolvulus* with *Viola* under his *Campanacæ*, combinations which modern Botanists entirely repudiate; and in like manner the association of *Hugonia* with *Chenads* by Endlicher, of *Nepenthes* with *Birthworts* by Brown, of *Planes* with *Witch Hazels* by Adolphe Brongniart, of *Vines* with *Berberries* by the Author of this work, of *Spurgeiworts* with *Heathiworts* and *Chenopods* by Fries, are so many modern instances of peculiar views from which other Botanists withhold their assent.

It is therefore of the first importance to settle with something like precision what it is that constitutes likeness among plants, or, as it is technically called, their affinity.

The reason why the vulgar commit mistakes in judging of natural affinity is, because they draw their conclusions from unimportant circumstances, the chief of which are size, form, and colour. The multitude of size gave rise to the old notion that all trees made a class by themselves; which is as if in a classification of animals the horse, the lion, and elephant were placed in a different part of the animal kingdom from the rat, the cat, and the goat. Form is another of the false guides which lead in error: if all round-leaved or square-stemmed plants are to be associated, so ought glass to be classed with the diamond when it is cut to the same shape. Colour is less a source of mistake, and yet it is sometimes unconsciously employed by the superficial observer, as when he calls all yellow-flowered Composites Marigolds, and all white-flowered vernal bushes Thorns. It



must be evident to the most careless thinker that such resemblances are trifling.

That which really determines affinity is correspondence in structure. It may be said that those plants are most nearly related which correspond in the greatest number of points, and those the most distantly in which we find the fewest points of correspondence ; and this must be true when we remember that if every point in the structure of any two plants is found to be alike, then those two must be identical. But it will be obvious that an examination of all plants through every detail of their organisation is impracticable ; it has never in fact been accomplished in any one case. Experience must have shown that the organs of vegetation are of very different degrees of value in determining resemblance in structure, that some are of paramount importance, others of less consequence, and others of comparative insignificance. Hence the relative value of characters forms a most important part of the study of the Botanist ; it is in fact the pivot upon which all the operations of a systematist must turn.

The only intelligible principle by which to estimate their respective value is according to their known physiological importance ; regarding those organs of the highest rank which are most essential to the life of the plant itself ; placing next in order those with which the plant cannot dispense if its race is to be preserved ; assigning a still lower station to such organs as may be absent without considerable disturbance of the ordinary functions of life ; and fixing at the bottom of the scale those parts, or modifications of parts, which may be regarded as accessory, or quite unconnected with obviously important functions.

The first office which all organised beings have to perform is that of feeding ; for it is thus only that their existence is maintained. The second is that of propagating, by means of which their species is perpetuated. These being functions of the highest importance, it is reasonable to conclude that the organs provided for their proper execution must be of the highest importance also, and hence that they are beyond all others valuable for the purposes of classification. And, again, because the power of feeding must come before that of propagating, it might be conjectured beforehand that the organs destined for the former operation would afford the first elements of a Natural method. But since the action of feeding is very simple in the Vegetable Kingdom, because of the similar modes of life observable among plants, while, on the contrary, the act of propagation is highly diversified, on account of the very varied nature or structure of the parts by which it is accomplished ; so might we conjecture that the organs of nutrition would afford but few distinctions available for purposes of classification, while those of fructification would furnish many. And such is the fact. Hence it is that the great classes of plants are principally distinguished by their organs of growth, and that in the numerous minor groups such peculiarities are comparatively disregarded, their chief distinctions being derived from their parts of reproduction. These principles are more fully expressed in the following axioms :—

1. Peculiarities of structure which are connected with the manner in which a plant is developed are *physiological* ; those which are connected with the manner in which parts are arranged are *structural*. Physiological characters are of two kinds, viz., those which are connected with the *mode of growth* (the organs of vegetation), and those which regulate *reproduction* (the organs of fructification). Physiological characters are of greater importance in regulating the natural classification of plants than structural.



2. All modifications of either are respectively important, in proportion to their connection with the phenomena of life.

3. If we allow ourselves to be steadily guided by those considerations, we shall find that the internal or anatomical structure of the axis, and of the foliage, is of more importance than any other character; because these are the circumstances which essentially regulate the functions of growth, and the very existence of an individual.

4. That next in order is the internal structure of the seed, by which the species must be multiplied. Thus the presence of an embryo, or its absence, the first indicating a true seed, the latter a spore, are most essential circumstances to consider. And so also the existence of albumen in abundance round the embryo, or its absence, must be regarded as a physiological character of the highest value: because, in the former case, the embryo demands a special external provision for its early nutriment, as in oviparous animals; while, in the latter case, the embryo is capable of developing by means of the powers resident in itself, and unassisted, as in viviparous animals.

5. Next to this must be taken the structure of the organs of fructification, by whose united action the seed is engendered; for without some certain, uniform, and invariable action on their part, the race of a plant must become extinct. Thus we find that the structure of the anthers, placenta, and ovules, are more uniform than that of the parts surrounding them, while their numbers are variable: and the condition of the filament, which appears of so little importance in a physiological point of view, is also inconstant. So also the texture and surface and form of the pericarp, which acts as a mere covering to the seeds, is not to be regarded in those inquiries, and, in fact, differs from genus to genus; as, for instance, between *Pyrus* and *Stranvaesia*, or *Rubus* and *Spiraea*, in the truly natural Rosaceous Order.

6. On the other hand, the floral envelopes seem to be unconnected with functions of a high order, and to be designed rather for the decoration of plants, or for the purpose of giving variety to the aspect of the vegetable world; and, consequently, their number, form, and condition, presence or absence, regularity or irregularity, are of low and doubtful value, except for specific distinction. There seems, indeed, reason to expect that every Natural Order will, sooner or later, be found to contain within itself all the variations above alluded to. Even in the cases of regularity and irregularity, we already know this to be so: witness *Veronica* and *Scutellaria* in Figworts, and *Hyoscyamus* in Nightshades, *Delphinium* in Crowfoots, and *Polygonum* in Cranesbills.

7. The consolidation of the parts of fructification is a circumstance but little attended to in a general point of view, except in respect to the corolla: but as it seems to indicate either the greatest change that the parts can undergo, or, where it occurs between important and usually unimportant organs, that in such cases the latter become essential to the flower, it probably deserves to be regarded with great attention. For instance, the presence or absence of the corolla is often a point of little moment, and is, we know, a very fluctuating circumstance. This is especially true of those Natural Orders in which the stamens and petals are separated: as in *Wormworts*, *Rhamnads*, *Onagrads*, &c. On the other hand, when the stamens, which are indispensable organs, adhere to the petals, the latter are more constantly present, as in *Figworts*, *Acanthads*, *Nightshades*, &c.

There are also certain other principles which experience tells us the systematist must keep in view; and most especially that of regarding of



importance whatever appears to be constant in its nature among nearly allied species. Nothing which is thus constant can be considered unimportant, for everything constant is dependent upon or connected with some essential function. Therefore all constant characters, of whatever nature, require to be taken into account in classifying plants according to their natural affinities. Of this nature are the internal structure of stems and leaves, the anatomical condition of tissue, the organisation of the anther, pollen, and female apparatus, and the interior of the seed.

On the other hand, whatever points of structure are variable in the same species, or in species nearly allied to each other, or in neighbouring genera, are unessential to the vital functions, and should be set aside, or be regarded as of comparative unimportance. Hence the badness of the Monopetalous, Polypetalous, and Apetalous divisions of Jussieu, depending upon the mere presence or absence, and union or disunion, of petals. The genus *Fuchsia*, for example, has petals highly developed; but in *F. excorticata* they are absent, and yet the plant differs no otherwise from the rest of the genus: the same is true of species of *Rhamnus*. Again, the *Rue* has the petals separate; and *Correa*, very nearly allied to it, has them combined.

All classifications in which the foregoing principles are observed are natural; and that will be the most stable in which they are employed with the greatest skill. Some writers, indeed, maintain that there cannot be more than one really natural system, any more than one planetary system; and in a certain sense this may be true, inasmuch as we must suppose that one plan only has been observed in the creation of living things, and that a natural system is the expression of that plan. But, on the other hand, it must not be forgotten that such a plan may be represented in many ways; and that although the order of nature is in itself settled and invariable, yet that human descriptions of it will vary with the mind of the describer. A universal history is a collection of events; but it is not necessary that all universal histories should follow the same order of narration. The events themselves are unalterable, but the way of combining them and causing them to illustrate each other is manifold.

In natural science, indeed, the mode of arranging the matter is susceptible of infinitely more variation than history: because in the latter subject time is an inflexible leader who cannot be lost sight of. But in natural science there is no beginning and no end. It is impossible, from the nature of things, that any arrangement should exist which shall represent the natural relations of plants in a consecutive series. It is generally admitted by those who have turned their attention to a consideration of the manner in which organised beings are related to each other, that each species is allied to others in different degrees, and that such relationship is best expressed by rays (called affinities) proceeding from a common centre (the species). In like manner, in studying the mutual relationship of the several parts of the Vegetable Kingdom, the same form of distribution constantly forces itself upon the mind: Genera and Orders being found to be apparently the centre of spheres, whose surface is only determined by the points where the last traces of affinity disappear. But although the mind may conceive such a distribution of organised beings, it is impossible that it should be so presented to the eye, and all attempts at effecting that object must of necessity fail. If in describing the surface of a sphere we are compelled to travel in various directions, continually returning back to the point from which we started; and if in presenting it to the eye at one glance we are compelled to project it upon a plane, the effect of which is to



separate to the greatest distance some objects which naturally unite each other; how much more impossible must it be to follow the precept—*no matter in treating of the solid contents of a sphere!*

An arrangement, then, which shall be so absolutely correct an expression of the plan of nature as to justify its being called *the* Natural System is a chimera.\* All that the Naturalist can do is to carry into effect the principles above explained, with a greater or less amount of skill: the result of which will be *a* Natural System.

When Linnæus attempted to form a Natural System, he merely threw together such genera as he knew into 67 groups, which he called *Fragments*, and which were equivalent to the Natural Orders of Modern Botany. This plan advanced a step further, by forming 15 Classes, under which he placed 100 Natural Orders. At a later period the name Class was reserved for the three great divisions of Acotyledons, Monocotyledons, and Dicotyledons: and the Orders were collected into smaller groups called Sub-classes: and thus, by degrees, the necessity of forming three grades of distinctive characters superior to genera was recognised. But our countryman, Dr. Robert Brown, whose sagacity is not the least remarkable part of his scientific character, long ago pointed out the insufficiency of even this amount of subdivision, and proposed the combination of Natural Orders into groups intermediate between Orders and Sub-classes. The necessity of this measure is now universally acknowledged: attempts have been made for some years, by various Botanists, to work out the problem; and I think it must be conceded that a real advance has thus been made, by the efforts of various independent observers, to the accomplishment of so very desirable an object. To such attempts the present work is an addition.

The leading idea which has been kept in view in the compilation of it has been this maxim of Fries: *Singula sphæra (sectio) ideam quamvis exprimit, inique ejus character nativæ simpliciter optime exprimitur*. I cannot but think that the true characters of all natural assemblages are extremely simple; nothing can be more certain than that their value diminishes in proportion to their complexity. If two objects are not to be distinguished by a few simple circumstances, they can hardly be called distinguishable at all. In the highest groups or classes it is always so (see p. 4;) and there is no apparent reason why the same rule should not obtain in groups of a minor rank. Nevertheless, we find that this is too often lost sight of, and that long details of structure are substituted for precise words of distinction.

It may be, and certainly is in some measure, true, that insuperable difficulties are, in the present state of our knowledge, opposed to strict definitions of Natural Orders, and *a fortiori* of their Alliances, &c. But that is no reason why we should not endeavour to render their distinctive characters as precise as the nature of the subject will permit. Vague distinctions, which are at once the bane and opprobrium of Natural History, are so repulsive to the understanding as to deter the mass of mankind from giving it their attentive study. And it is not too much to assert that this vagueness arises more frequently out of the prejudice or tasteless of the Naturalist's own mind than out of things themselves. It will constantly happen that two groups may stand, by common consent, in the nearest conceivable relation to each other; it is quite possible, by one way of arranging

\* Systematized nature ipso absoluteque quod non absolute methodi ratione hominum imperioque potest, est quoddam supra naturalem imperium, sicut et si quidem hominum non promissionibus, sed tantum tenet Naturæ auctor. — *Philos. Empiricæ præfatio*, p. 110.



them, to render their distinctions nugatory, and by another, clear and precise. Now, if the supposed groups are really as closely allied, as for this argument we may assume them to be, it can be of no possible importance theoretically, whether a given Genus or Order is placed in the one or the other. The near consanguinity of the two does away with all importance in such a case. In Physical Geography it is of no consequence whether London is stationed in Middlesex or Surrey; and in like manner, in Theoretical Botany, the place of a given Order may be equally indifferent. But it may be of great consequence practically, because a definition of limits may be possible or not, according to the arrangement. For example, let us take the Solanal and Bignonial Alliances. These touch at the Orders of Nightshades and Figworts respectively. If Nightshades are placed in the Bignonial Alliance because of their intimate relation to Figworts, no apparent means remain of clearly defining what is meant by the Bignonial Alliance. If, on the other hand, Figworts are stationed in the Solanal Alliance, then the distinctive characters of that Alliance are also rendered obscure and difficult, or impossible of application. But place Nightshades in the Solanal, and Figworts in the Bignonial Alliance, and the language of Botanists affords as clear a discrimination as can be wished for. And so of other cases. Indeed, I am so persuaded of this, that in my opinion all instances of confused and vague characters are only so many proofs of Botanists not having clearly understood the plants that they have endeavoured to classify.\*

It will, perhaps, be alleged that the doctrine just inculcated is directly opposed to the first principles of a Natural System: but such is not the case. No absolute limits, in fact, exist, by which groups of plants can be circumscribed. They pass into each other by insensible gradations, and every group has apparently some species which assumes in part the structure of some other group. Two countries are separated by a river whose waters are common to both banks: in a geographical division of territory the river may be assigned to either the left bank or the right bank, but such an arrangement is arbitrary; and yet the interior of the countries is unaffected by it. So with the groups of plants; it cannot be of any possible consequence whether an intermediate or frontier plant be assigned to one group or another, and convenience alone should be considered in such a matter. This long since led me to offer the following observations, the justice of which, much more experience entirely confirms:—"All the groups into which plants are thrown are in one sense artificial, inasmuch as Nature recognises no such groups. Nevertheless, consisting in all cases of species very closely allied in nature, they are in another sense natural. But as the Classes, Sub-classes, Alliances, Natural Orders, and Genera of Botanists, have no real existence in nature, it follows that they have no fixed limits, and consequently that it is impossible to define them. They are to be considered as nothing more than the expression of particular *tendencies* (*nixus*), on the part of the plants they comprehend, to assume a particular mode of development. Their characters are only a declaration of their prevailing tendencies."

We must not, however, deceive ourselves with the expectation that by this or any other expedient definitions in Botany will become possible. Mathematical precision is unknown in such subjects, and exceptions occur

\* No Botanist will regard this as an offensive remark. It is the misfortune, not the fault, of men of science, that they cannot investigate everything with their own eyes, and that they are compelled, from the vastness of their subject, to take much of all they study upon trust. In Botany this is most especially the case: for who has ever been able to examine one-tenth of all the plants he speaks of, with minute accuracy?



to all known rules. "When Zoology," says Mr. M'Doo Edwards, "is not studied in systematic works, it is often supposed that each class, each family, and each genus, present to us boundaries precisely defined, and that there can be no uncertainty as to the place to be assigned, in a natural classification, to every animal the organisation of which is sufficiently known. But when we study this science from Nature herself, we are soon convinced of the contrary, and we sometimes see the transition from one plan of structure to an entirely different scheme of organisation take place by degrees so completely shaded one into the other that it becomes very difficult to trace the line of demarcation between the groups thus connected."—*Ann. Sc. Nat.* 1840, *Sept.* Ray long ago pointed this out in a very remarkable passage, which cannot be too often quoted.

"Verum quod alius dixi illud hic repeto et incubo, non sperandum à me Methodum unquam perfectam et omnibus suis numeris adesturam, quæ et plantas in genera ita distribuat ut universæ species comprehendantur, nullæ adhuc anomalæ et sui generis reliquæ, et unumquodque genus nullis suis propriis et characteristicis ita circumscribat, ut nullæ inveniantur species incerti, ut ita dicam, laris, et ad plura genera revocabiles. Nos enim id petitur natura rei. Nam, cum Natura (ut dici solet) non faciat saltus, neque ab extremo ad extremum transseat nisi per medium, inter superiores et inferiores, rerum ordines nonnullas mediæ et ambiguae conditionis producere solet, quæ de utroque participant, et utroque velut connectant, ut ad utrum pertineant omnino incertum sit. Præterea eadem alma parens in methodi cujuscunque angustias coerceri reponat, sed ad libertatem et ætærnitatem suam nullis legibus obnoxium ostentandum. In unoquoque rerum ordine nonnullas species creare solet, tanquam exceptiones à regulis generalibus, singulares et anomalas."—*Rytt. Hist. Plant.* vol. i. *Præf.* Linnaeus did but copy this when he asserted that Nature makes no leaps (*Natura non facit saltus*.—*Phil. Bot.* 77.)

This doctrine has, however, been lately called in question by no less eminent a writer than M. Alphonse De Candolle, who requires that absolute limits should be assigned to all groups of whatever degree. "If," he says, "we cannot state in what respect two families differ permanently and *universally*, those two families are but one. Two pieces of land which touch each other form one island, and not two; but two pieces of land which are separated by an arm of the sea, form two islands, and not one."—*Annales des Sciences*, series 3, vol. 1, p. 254. But this is a kind of reasoning wholly inapplicable to Natural History, for the reasons so admirably given by Ray, and is contrary to all experience. If the groups limited by M. Alphonse De Candolle himself are examined by this standard they alone suffice to demonstrate how visionary are such expectations. Mr. Bentham has satisfactorily answered the learned Botanist of Geneva. "We Botanists," he says, "cannot be so mathematically exact as geographers, and where an isthmus is very narrow, we must class the peninsula with the island. How often does it happen that two large centres, say of five hundred to two thousand or three thousand species, totally distinct from each other in all those species by a series of constant characters, are yet connected by some small isolated genus of a dozen, half a dozen, nay a single species, in which these very characters are so inconstant, uncertain, or variously combined as to leave no room for the strait through which we ought to navigate between the two islands."—*London Journal of Botany*, 4, 232. It would be very convenient to find that the views of M. Alphonse De Candolle were practically, but in truth they are quite Utopian.



While, however, the impracticability of absolute definitions is thus insisted upon, there can be no doubt that much more precision may be introduced than is too frequently found among them. Exceptions, although to some extent inevitable, are not uncommonly apparent, not real. It will frequently be found that a particular species is at variance with the definition of its Genus, or of a Genus with that of its Order, or of an Order with that of its Alliance; but, upon a full examination of all the structure of such supposed exceptions, it will turn out that they are misplaced, and do not in fact belong to the station which they occupy. Exceptions of this kind were formerly very common, but they are disappearing under the diligent criticism of modern observers. The genus *Rhynchotheca* may be taken as an example. The great feature of the Cranesbills is their beaked torus and folded-up embryo, and it is by that circumstance that they are essentially distinguished from their neighbours. But *Rhynchotheca* was described as having a beaked fruit and straight embryo; it therefore formed an apparent exception to the definition of Cranesbills. Investigation of the plant has however shown that its beak belongs to the carpels and not to the torus; and, therefore, it is merely an Oxalid, with a tendency towards the structure of a Cranesbill.

The manner in which the foregoing principles have been applied to practice has differed greatly, and the result has been schemes of various degrees of merit, some of which have dropped still-born from the press, while others continue to enjoy a well-deserved reputation. It would be alike unjust to their authors and the public to omit all mention of even the most obscure of these, each of which has been the result of much thought and patient study, and has doubtless contributed something to the progress of systematic science. But it would be beyond the object of the present sketch to treat them all at length, nor would the student derive any advantage from doing so. While, therefore, the following pages will be occupied by some account of every plan for a Natural classification of which I have any knowledge,\* since the year 1789 inclusive, and of those of Ray and Linnæus of an earlier date, such as are comparatively unimportant will be dismissed in a few words, and those only which have been really employed in practice will be stated at length. In order to render the latter more useful, references are given to the pages in the present work where an account of each Order may be found; so that those who are accustomed to the use of other systems may not experience inconvenience from the arrangement proposed in the work now submitted to their consideration.

\* I do not, however, include the arrangements of the German Naturphilosophists: not, indeed, from any disrespect to those learned men, but because I must confess my inability to master their ideas, or to comprehend how their views are made applicable to any intelligible classification. The student will, I believe, find full information upon the subject in Oken's *Lehrbuch der Naturphilosophie*, edition of 1813. See also Reichenbach's *Conspectus Rami Vegetabilis*, 1828, the same author's *Flora Germanica Racemosa*, 1830-2, and Schultz's *Natürliches System des Pflanzenreichs*, 1832.



## NATURAL SYSTEMS.

[When references are given after the names of Orders, in this part of the present work, they refer to the page where such Orders are to be found in the second edition.]

1703. RAY, John.—(*Methodus Plantarum secundum classis et ordines*).

Here we have the germ of the present methods of natural arrangement. In fact the first divisions of the Vegetable Kingdom, proposed by Ray, are identical with those of Jussieu. Like him, he proceeded from the more imperfect to the most highly organized forms; the only difference being that he placed Dicotyledons before Monocotyledons. The author's words are "Plurifera dividimus in *dicotyledones*, quarum semina siliis foliis anomalis, seminalibus dictis, quæ cotyledonum usum præstant, a terra exiunt, et in lines scilicet lobos dividuntur, quævis eos supra terram tollentem spedo non effugiant; et *monocotyledones* quæ nec folia seminaria hinc efferunt nec lobos hinc eadiunt. Hæc diviso ad arbores etiam extendi potest: simplicem palmæ et congenere hæc respectu eodem modo a reliquis arboribus differunt quo monocotyledones a reliquis herbis."

His plan was this:—

Plants are either

Flowerless, or

Flowering; and these are

Tricotyledonous, or

Monocotyledonous.

Among the genera of Ray, which were what we now call Natural Orders, were Fungi, Mosses, Ferns, Compositæ, Cichoraceæ, Umbellifers, Papilionaceous plants, Graminæ, Liliacæ, &c., under other names, but with limits not very different from those now assigned to them.

1751. LINNÆUS, Charles.—(*Philosophia Botanica*).

"Plante omnes utriusque altitudinis præstant, uti Terræ in majores præcipue."

The following is the Natural distribution first proposed by Linnæus, under the name of Fragments. Many of his groups were taken from his predecessors; others were contrived by himself. At a later period they underwent some alteration; but the last now given will serve to show the learned author's plan. He never assigned any characters to these Fragments.

- |   |   |
|---|---|
| 1. PRIMORIE. Arbut. &c. Piper, Phytolacca.                    | 24. BIGNONES. Azalea, Myrica, Moræna, Santalum, &c. |
| 2. PALMÆ. Corypha, &c., Cyas.                                 | 25. SACCARIF. Jasmium, Jasminum, Jasminum, &c.      |
| 3. SCITAGINÆ. Musci, Carex, Anagallis, &c.                    | 26. CECIDONIES. Thely, Bacc, Delonix, &c.           |
| 4. OROIDEÆ. Aspid.  | 27. VAGINATES. Polygamon, Lamiæ, &c.                |
| 5. ESSATE. Iris, &c., Nympha, Utricularia, Aplys, Anthus.     | 28. CUCULIATES. Moluccas, Epiphyllum, &c.           |
| 6. TRICOTYLOIDEÆ. Butyrus, Alisma, Sagittaria.                | 29. GENTIANÆ. Gentiana, Vinca, &c.                  |
| 7. DENDRACEÆ. Cereus, &c.                                     | 30. RHOISACEÆ. Pappus, Pappus, &c.                  |
| 8. STADIACEÆ. Echinops, Amaranthus, &c.                       | 31. PTERIDACEÆ. Cypripedium, &c.                    |
| 9. CORNACEÆ. Ostrya, Salix, &c.                               | 32. CAMERACEÆ. Cameraria, &c.                       |
| 10. LILIACEÆ. Lilium, Tulip, &c.                              | 33. LONICERACEÆ. Salix, &c.                         |
| 11. MORGANACEÆ. Bromelia, &c.                                 | 34. CUCULIACEÆ. Cuscuta, &c.                        |
| 12. CORONATEÆ. Anemone, Ranunculus, &c.                       | 35. SERRACEÆ. Serraria, &c.                         |
| 13. CUCULIACEÆ. Scirpus, &c., Juncus.                         | 36. COMPOSITE. Compositæ, &c.                       |
| 14. GRAMINÆ. Aspid.   | 37. POMACEÆ. Pomaceæ, &c.                           |
| 15. CONIFERÆ. Abies, Pinus, &c.                               | 38. DIOICACEÆ. Dioica, &c.                          |
| 16. AMENACEÆ. Pistacia, Alnus, Populus, Juglans, Quercus, &c. | 39. ARISTACEÆ. Aristaceæ, &c.                       |
| 17. NUCAGINACEÆ. Nanthium, Iva, &c.                           | 40. CUCULIACEÆ. Cuscuta, &c.                        |
| 18. AGGREGATEÆ. Statice, Protea, Helianthus, &c.              | 41. HESPERACEÆ. Hesperia, &c.                       |
| 19. DEMOSCEÆ. Viburnum, Ruscus, &c.                           | 42. CUCULIACEÆ. Cuscuta, &c.                        |
| 20. SCABRACEÆ. Ficus, &c.                                     | 43. ASCACEÆ. Ascaris, &c.                           |
| 21. COMPOSITE. Aspid.   |   |
| 22. UMBELLACEÆ. Aspid.  |   |
| 23. MORTISQUEÆ. Modern Crowfeet.                              |   |



44. STELLATÆ. Galium, &c., Hedyotis, Spigelia, Corrus, Collea, &c.  
 45. CUCURBITACEÆ. Passiflora and Cucurbits.  
 46. NECTANDRÆ. Cactus, Mesembryanthemum, Solanum, Oxalis, Fagonia, &c. &c.  
 47. TETRACERÆ. Cambogia, Euphorbia, &c., Cliffortia, Sterculia, &c.  
 48. INCANATÆ. Hippuris, Elatine, Ruppia, Typha, &c.  
 49. SAMBUCACEÆ. Vitis, Hedera, Houstonia, Ruscus, Smilax, Menispermum, Aristolochia, &c.  
 50. TRIBUTARÆ. Sapindus, Malpighia, Begonia, Berberis, &c.  
 51. PLEURÆ. Part of modern Primnorts.  
 52. ROTACEÆ. Gentiana, Lycinachia, Anagallis, &c.  
 53. HOLERACEÆ. Spinacia, &c., Herniaria, Callitriche, Petiveria, &c.  
 54. VERECULÆ. Rhamnus, &c., Lycium, Daphne, &c.  
 55. PAVILLONACEÆ. AS NOW.  
 56. LOMENACEÆ. Leshmious plants, with HEDERACEÆ. Hedera and Vitis, &c. jointed pods, Cassalpiniceæ and Mimoseæ.
57. SILIQUOSÆ. Crucifers.  
 58. VERTICILLATÆ. Labiatis.  
 59. PERSONATÆ. Fieiworts, Sesamum, Justicia, Bignonia, Verberna, &c.  
 60. PERFORATÆ. Hypericum, Cistus, Telephium.  
 61. STATUMINATÆ. Ulmus, Celtis, Bosea.  
 62. CANDELLARÆ. Rhizophora, Mimuspops, Nyssa.  
 63. CYMOSEÆ. Lonicera, Loranthus, Ixora, Cinchona, &c.  
 64. FILICES. AS NOW.  
 65. MUSCI. AS NOW.  
 66. ALGÆ. Nearly as now.  
 67. FUNGI. AS NOW.  
 68. VAGÆ. All his doubtful genera.

At a later period Nos. 7, 10, 11, 17, 26, 27, 36,

38, 39, 60, 61, 62 and 63, were cancelled; and four

added, viz.

GRUINALÆ. Cranesbills.

CALYPTIFLOREÆ. Oxyris. Trophis, Hippophæe,

Elæagnus.

MISCELLANÆ. Hedera and Vitis, &c.

A curious mixture.

1789. JUSSIEU, Antoine Laurent de.—(*Genera Plantarum secundum ordines naturales disposita, juxta methodum in horto regio Parisiensi tractatum, anno MDCCCLXXIV.*)

Adopting the views of Ray as to primary divisions, Jussieu applied them to the system of Tournefort, which had been in common use in France from the year 1694, and which was by far the best suited for the state of knowledge of the age in which it was promulgated. To this he added the position of the stamens with respect to the ovary, and thus constructed his 15 classes in the following manner:—

		CLASS.
Acotyledones.		I.
Monocotyledones.	{ Stamina hypogyna.	II.
	{ ——— perigyna.	III.
	{ ——— epigyna.	IV.
Dicotyledones.	{ Stamina epigyna.	V.
	{ ——— perigyna.	VI.
	{ ——— hypogyna.	VII.
	{ Corolla hypogyna.	VIII.
	{ ——— perigyna.	IX.
	{ ——— epigyna. { Antheris connatis.	X.
	{ ——— epigyna. { Antheris distinctis.	XI.
Polypetalæ.	{ Stamina epigyna.	XII.
	{ ——— hypogyna.	XIII.
	{ ——— perigyna.	XIV.
Dielines irregulares.		XV.

Under each of these classes he arranged his Natural Orders as follows, usually deriving their name from some genus, which he regarded as a good illustration of their general structure.

Class I.	Class IV.	Class VIII.	Class X.
1. Fungi, 29	19. Muscæ, 163	34. Lysimachia, 644	53. Cichoraceæ, 702
2. Algæ, 8	20. Cannæ, 165	35. Pedicularæ, 681	54. Cinarocephalæ, 702
3. Hepaticæ, 58	21. Orchidæ, 173	36. Acanthi, 678	55. Corymbifera, 702
4. Musci, 64	22. Hydrocharidæ, 141	37. Jasminea, 650	
5. Filices, 74		38. Viticeæ, 663	Class XI.
6. Nardes, 143		39. Labiatæ, 659	56. Dipsacæ, 699
	Class V.	40. Scrophulariæ, 681	57. Rubiaceæ, 761
	23. Aristolochiæ, 792	41. Solanæ, 618	58. Caprifolia, 766
		42. Boraginæ, 655	
	Class VI.	43. Convolvuli, 630	Class XII.
7. Areolæ, 127	24. Eragmi, 257	44. Polemonia, 635	59. Araliæ, 780
8. Typhæ, 126	25. Thymelææ, 530	45. Bignonie, 675	60. Umbellifera, 773
9. Cyperodendæ, 117	26. Proteæ, 532	46. Gentianæ, 612	
10. Graminæ, 106	27. Lauri, 535	47. Apocineæ, 589	Class XIII.
	28. Polygonæ, 502	48. Sapotæ, 590	61. Ranunculaceæ, 425
	29. Atriplicæ, 512		62. Papaveraceæ, 430
		Class IX.	63. Crucifera, 351
	Class VII.	49. Guaiacanæ, 595	64. Caparides, 357
11. Palmæ, 134	30. Amaranthi, 510	50. Rhododendra, 453	65. Sapindi, 382
12. Asparagi, 200	31. Plantaginæ, 642	51. Eucæ, 453	66. Acera, 387
13. Junci, 191	32. Nyctaginæ, 506	52. Campanulaceæ, 689	67. Malpighiæ, 388
14. Liliæ, 200	33. Plumbaginæ, 640		68. Hyperica, 405
15. Bromeliæ, 147			
16. Asphodeli, 200			
17. Narcissi, 155			
18. Iridæ, 159			



69. Gentianeae, 469	78. Boraginaceae, 472	93. Caryophyllae, 481	115. Umbelliferae, 500
70. Amaryllid. 467	79. Thymellae, 471	94. Euphorbiaceae, 482	116. Compositae, 501
71. Malac. 466	80. Gent. 470	95. Ranuncul. 483	117. Labiales, 502
72. Aconit. 468	81. Rutaceae, 469	96. Compositae, 484	118. Scrophulaceae, 503
73. Convolv. 465	82. Caryophyllae, 476	97. Malac. 485	119. Solanaceae, 504
74. Malvaceae, 467	Class XIV.		120. Scrophulaceae, 505
75. Menisperm. 417	83. Scrophulaceae, 444	98. Solanaceae, 486	121. Aconit. 506
76. Aconit. 420	84. Scrophulaceae, 447	99. Euphorbiaceae, 487	122. Ranuncul. 507
77. Menisperm. 417			

1310. Brown, Robert. — (*Philosophical Essay on the Holiness of the*.)

In this work the system of Jussieu is principally followed, but the Classification arbitrary, and the sequence of the Orders is changed. The author states that he regards most of the Orders of Jussieu as being truly natural, but his reasons, as the author himself admits, often artificial, and apparently founded upon doubtful principles. It was the intention of Dr. Brown to publish a second volume of his work, and then to express his views upon this and other subjects; but that intention has not yet been carried into execution. It is here that we find the importance of the association of the three points laid out, and applied to the characters of Natural Orders. These characters have been a model for succeeding writers.

1311. De Candolle, A. P. — (*Théorie Élémentaire de la Botanique, ou Exposition des Principes de la Classification Naturelle et de l'Art de décrire et d'analyser les Végétaux*.)

In this work is to be found the explanation of the principles which guided its clear-minded author to the construction of a method of arrangement which has now almost superseded all others, partly because of its easiness and simplicity, and most especially because it is that which has been followed in the author's *Philosophie*, or *elementary description of species*. He himself explains the course he has taken, to the following effect:—"I place Dicotyledons first, because they have the greatest number of distinct and separate organs. Then, as I find families where some of these organs become consolidated, and consequently seem to disappear, I refer them to a lower rank. This principle gives me the following series:—

1. Dicotyledons; polypetalous and hypogynous.
2. ————— and perigynous.
3. ————— monotropous and perigynous.
4. ————— and perigynous.
5. ————— apetalous, but with a single perianth.
6. Monocotyledons; polypetalous.
7. ————— and perigynous.
8. Acaulescent; leafy and rootless.
9. ————— leafy and rootless, and only known by roots.

I have adopted this series partly because I think it that which is least removed from a natural sequence, and partly because it is convenient and easy for study. But let no one imagine that I attach the least importance to it. The true science of general Natural History consists in the study of the symmetry peculiar to each family, and of the relation which these families bear to each other. All the rest is merely a scaffolding, better or worse suited to accomplish that end."—p. 206, *first edition*.

At this time De Candolle made no attempt to combine the Natural Orders in Alliances; but at a later period (1319), in a second edition of the *Théorie*, he proposed a few such groups, under the name of Cohorts, as will be seen by the following list of the Orders, taken from the edition of 1315. In that of 1314, published by his own early death, these Cohorts are all broken up, and considerable alterations are made in the sequence of the Natural Orders. I, however, prefer publishing his plan of forming Alliances, rather than his last list, even although that does give his latest views of Orders.

I. VASCULAR OR COTYLEDONOUS PLANTS; that is to say, furnished with cellular tissue and vascular, and whose cotyledon is provided with one or more cotyledons.	A. Perianth double; that is, where the outer and inner whorls are distinct.	6. Barbatiflorae, 417	18. Juncaceae, 417
	THALAMIFLOREAE.	7. Podophylae, 416	19. Araceae, 418
I. EXANGUIS OR DICTOTYLEDONOUS; that is to say, where the vascular are arranged in concentric layers, of which the youngest are the outermost, and where the embryo has opposite or verticillate cotyledons.	Petalis distinct, inserted on the receptacle.	8. Symplocaraceae, 418	20. Labiales, 419
	Cohort I. Carpel numerous, or stamens opposite the petals.	Cohort II. Carpel and stamens numerous, inserted on the receptacle.	Cohort III. Carpel and stamens numerous, inserted on the receptacle.
	1. Ranunculaceae, 425	9. Papaveraceae, 419	21. Ranunculaceae, 425
	2. Dilleniaceae, 426	10. Fumariaceae, 420	22. Fumariaceae, 420
	3. Marubaceae, 417	11. Gentianeae, 421	23. Gentianeae, 421
	4. Anemoneae, 420	12. Campanulaceae, 422	24. Campanulaceae, 422
	5. Menispermaceae, 417	13. Fumariaceae, 423	25. Fumariaceae, 423
		14. Fumariaceae, 424	26. Fumariaceae, 424
		15. Anemoneae, 425	27. Anemoneae, 425
		16. Papaveraceae, 426	28. Papaveraceae, 426
		17. Ranunculaceae, 427	29. Ranunculaceae, 427



31. Aceraceæ, 387
32. Malpighiaceæ, 388
33. Hippocastanaceæ, 384
34. Hypericaceæ, 405
35. Guttiferæ, 400
36. Marnegaviaceæ, 403
37. Saurauaceæ, 439
38. Gentianeæ, 493
39. Gesneriaceæ, 461
40. Meliaceæ, 463
41. Hesperidaceæ, 457
42. Cameliaceæ, 466
43. Olaceæ, 444
44. Rutaceæ, 469

Cohort IV. Fruit gyno-  
basie.

45. Simaroubaeæ, 476
46. Ochnaceæ, 474

CALYCELORE.

Petals free or more or less  
united, always perigynous  
or inserted on the  
calyx.

47. Frankiaceæ, 581
48. Saniculiæ, 590
49. Zanthoxyliæ, 472
50. Juncaceæ, 292
51. Tonibinthaceæ, 465
52. Leguminosæ, 544
53. Rosaceæ, 563
54. Salicariæ, 574
55. Tamariscinæ, 341
56. Melastomæ, 731
57. Myrtinæ, 744
58. Combretaceæ, 717
59. Cneoraceæ, 311
60. Loasaceæ, 744
61. Onagraceæ, 724
62. Fumariæ, 325
63. Paronychiæ, 510
64. Portulacæ, 500
65. Nepelæ, 746
66. Grossulariæ, 750
67. Crassulaceæ, 344

68. Saxifragæ, 567
69. Cunoniaceæ, 571
70. Umbellifere, 773
71. Araliaceæ, 790
72. Caprifoliæ, 766
73. Loranthæ, 789
74. Rubiaceæ, 761
75. Operculariæ, 761
76. Valerianæ, 697
77. Dipsacæ, 689
78. Calyceræ, 701
79. Compositæ, 702
80. Campanulaceæ, 689
81. Labellaceæ, 692
82. Gesneriæ, 671
83. Vacciniæ, 757
84. Ericinæ, 453

COROLLIFLORE.

Petals united into an by-  
pogynous corolla, or not  
attached to the calyx.

85. Myrsinæ, 647
86. Sapotæ, 590
87. Ternstroemiæ, 396
88. Ebenaceæ, 595
89. Oleaceæ, 616
90. Jasmineæ, 650
91. Strychnæ, 602
92. Apocynæ, 599
93. Gentianeæ, 612
94. Bignoniaceæ, 675
95. Sesameæ, 669
96. Polemoniaceæ, 635
97. Convolvulaceæ, 630
98. Boraginæ, 655
99. Solanæ, 618
100. Antirrhinæ, 681
101. Rhinanthaceæ, 681
102. Labiatæ, 659
103. Myoporinæ, 665
104. Pyrenaceæ, 663
105. Acanthaceæ, 678
106. Lentibulariæ, 686
107. Primulaceæ, 644
108. Globulariæ, 666

B. MONOCHLAMYDÆ.

Perianth simple, or whose  
calyx and corolla form  
only one envelope.

109. Plumbaginæ, 640
110. Plantaginæ, 642
111. Nyctaginæ, 506
112. Amaranthaceæ, 510
113. Chenopodiæ, 512
114. Begoniaceæ, 318
115. Polygonæ, 502
116. Laurinæ, 535
117. Myrsinæ, 301
118. Proteaceæ, 532
119. Thymelææ, 530
120. Santalaceæ, 787
121. Elæagnæ, 257
122. Aristolochiæ, 792
123. ? Euphorbiaceæ, 744
124. Monimiæ, 298
125. Urticæ, 260
126. Piperitæ, 515
127. Amontaceæ, 254
128. Coniferæ, 226.

2. Endogens or Mono-  
cotyledons ; that is to  
say, plants whose ves-  
sels are arranged in  
bundles, the youngest  
being in the middle of  
the trunk, and whose  
embryo is furnished  
with solitary or alter-  
nate cotyledons.

A. PHANEROGAMS.

Fructification visible, reg-  
ular.

129. Cycadææ, 223
130. Hydrocharidææ, 141
131. Alismaceæ, 209
132. Orchidææ, 173
133. Drymorrhizææ, 165
134. Musaceæ, 163

135. Iridææ, 159
136. Hamodoraceæ, 151
137. Amaryllidææ, 155
138. Hemerocallidææ, 200
139. ? Dioscoreæ, 214
140. Smilacææ, 215
141. Liliacææ, 200
142. Colchicacææ, 198
143. Juncææ, 191
144. Commelinææ, 188
145. Palmææ, 133
146. Pandanææ, 130
147. Typhaceææ, 126
148. Aroidææ, 127
149. Cyperacææ, 117
150. Graminææ, 106

B. CRYPTOGRAMS. Fructi-  
fication hidden, un-  
known or irregular.

151. Naiades, 143
152. Equisetacææ, 61
153. Marsiliacææ, 71
154. Lycopodiææ, 69
155. Filices, 78

II. CELLULAR OR ACOTY-  
LEDONOUS PLANTS ;  
that is to say, composed  
of cellular tissue only,  
not furnished with ves-  
sels, and whose embryo  
is without cotyledons.

A. FOLIACEÆ, having  
leaf-like expansions,  
and known sexes.

156. Musci, 64
157. Hepaticææ, 58

B. APHYLLÆ, not having  
leaf-like expansions,  
and no known sexes.

158. Lichenes, 45
159. Hypoxyla, 29
160. Fungi, 29
161. Algeæ, 8

1825. AGARDH, Carl von.—(*Classes Plantarum*).

This is a duodecimo pamphlet of 22 pages, with a coloured map, and is a recapitulation of the views of classification promulgated by its author between 1821 and 1826, in his *Aphorismi Botanici*. The object is to group Natural Orders in Classes, that is to say, in divisions subordinate to the primary ramifications of a system, and equivalent to my Alliances. "Classes," says Bishop Agardh, "should be formed by the same rules and on the same principles as Genera and Orders ; and therefore not by the breaking up of higher groups, but by the gathering together of lower groups. Yet, up to this time, all the so-called natural classes of plants have been formed upon an opposite principle, with the exception of the arrangement of Batsch.—We must distinguish, with Linnæus, between the character of a plant and its affinity. The former is derived from the latter, and not *vice versa*. Plants will sometimes agree in very few characters, which nevertheless are bound together by the strongest possible affinity. For instance, *Ceratonia* is very different from Leguminous plants, and *Fraxinus* from Jasmynes ; yet they are nearly allied."

Agardh's primary divisions are nine ; namely,

1. Acotyledons.
2. Pseudocotyledons.
3. Cryptocotyledons.
4. Phanerocotyledons ; incomplete.
5. ————— ; complete, hypogynous, monopetalous.
6. ————— ; —————, polypetalous.
7. ————— ; —————, discigynous, monopetalous.
8. ————— ; —————, polypetalous.
9. ————— ; —————, perigynous.

But he adds, that the perigynous and discigynous structures run together, and that no fixed difference can be found between the monopetalous and polypetalous conditions.

The Classes or Alliances which are formed within these primary groups are contrived without sufficient regard to the definitions which precede them, and by which alone they are to be recognised. In fact, the principle of disregarding characters and trusting



merely to (presumed) affinity, is carried to such a length as to dissolve the value of the groups; and hence, no doubt, Agarph's method has never been adopted, notwithstanding its merits in some respects.

He describes, in the following words, what he conceives to be the fundamental principles of natural classification:—

“*Forma normalis in omnibus plantis non reque perspicua, nec univocata in quibusque sectione sensum magis manifestum et explicitum, ita et in quibusdam generibus perfectissima appareat, et in aliis vix perspicienda.*

“*Forma normalis constantior comitat in fructificatione, hoc, in flore et fructu, quoniam in habitu, tam quoniam in manu tantum finem non explicatur, cum organa vegetabilium inbreve etiam florem et fructum præcipue debent, quam etiam quod partes vegetabilium individuum tantum servant, fructus vero totum vegetabilium partem non tantum.*

“*Sapitur tamen sæpiusne habitu fructificationem, ita ut plantæ quæ flore et fructu non differant, habitu etiam quodam generali convenient. Non autem semper hoc necessarium.*

“*Hinc systema in fructificatione nititur.*

“*Ceterum observandum, quod fructus jamdudum plantam quamvis non explicatam continet, et quod planta antequam flos et fructus eam coronet, non perfecta est.*

“*In sectione vero illa, quam speciem vocamus, non fructus solus characteres præbet, quia in omnibus notis, præter quod e causis accidentalibus pendeat, convenire debent individua ejusdem speciei.*

“*Adtantes plantarum componitur secundum nostram sententiam tam e multisque characterum quorumcumque in quibus conveniunt, quam ex eorum præstantia et prominentia.*

“*Sic sufficit vel levis nota in flore et fructu, si multis notis habitandibus conveniant plantæ; et quo præciores notæ præstantiorum partium communes sunt, eo plurius convenire debent in partibus minoris momenti. Sic etiam quo magis prominet character quidam, eo minus dilaceranda sectio, etiam si pluribus aliis rebus differant plantæ ab ea incluse.”*

1326. FERLER, C. J.—*Lehrbuch der Naturgeschichte der Pflanzenswelt.*

See this author's Clavis, 1838, p. xlix.

1327. DUMORTIER, R. C.—*Flora Belgique.*

The following is the system of this author, who does not appear to have given any account of its principles. His Orders are equivalent to Alliances. His *Stamens* begins with Conifers and ends with Lemnads, and is the only part concerning which I find any details:—

CLASSES.	SUBCLASSES.	DIVISIONS.	ORDERS.
Staminacea	Corticalia	Simplexium	1. <i>Juniperacea</i>
			2. <i>Fructifloracea</i>
		Tubifloria	3. <i>Thalamitaceæ</i>
			4. <i>Thalamitæ</i>
			5. <i>Fructifloræ</i>
			6. <i>Fructifloræ</i>
	Decorticalia	Unguliflora	7. <i>Calceitaceæ</i>
			8. <i>Thalamitaceæ</i>
		Bilocaria	9. <i>Thalamitaceæ</i>
			10. <i>Fructifloræ</i>
		Siliacea	11. <i>Calceitæ</i>
			12. <i>Fructifloræ</i>
Polinacea	Capsellia		13. <i>Thalamitæ</i>
			14. <i>Fructifloræ</i>
	Empsellia		15. <i>Fructifloræ</i>
			16. <i>Fructifloræ</i>
Fludacea	Siliarnia		17. <i>Fructifloræ</i>
			18. <i>Fructifloræ</i>
	Pharmacia		19. <i>Fructifloræ</i>
			20. <i>Fructifloræ</i>

#### CHARACTERS OF THE ORDERS.

1. *Juniperacea*.—Flowing spikes, placed on a stalk.
2. *Fructifloracea*.—Floral envelope none, epistemon.
3. *Thalamitaceæ*.—Floral envelope none, hypogynous.
4. *Thalamitæ*.—Tube of a monostylous corolla epistemon.
5. *Fructifloræ*.—Tube of a monostylous corolla epistemon.
6. *Fructifloræ*.—Claws of a polypetalous corolla epistemon.
7. *Calceitaceæ*.—Claws of a polypetalous corolla epistemon.
8. *Thalamitaceæ*.—Claws of a polypetalous corolla hypogynous.
9. *Thalamitæ*.—Corolla hypogynous.
10. *Fructifloræ*.—Corolla epistemon.
11. *Calceitæ*.—Corolla perigynous.
12. *Fructifloræ*.—Floral envelope none, epistemon.
13. *Thalamitæ*.—Floral envelope none, hypogynous.







Class I. *FRUIT.*  
*Convolvaceae*, 20  
*Convolvulaceae*, 20  
*Convolvulaceae*, 20  
*Convolvulaceae*, 20

Class II. *LEUCOMYCES.*  
*Convolvulaceae*, 40  
*Convolvulaceae*, 40  
*Convolvulaceae*, 40

Class III. *ALGAE.*  
*Convolvulaceae*, 18  
*Convolvulaceae*, 14  
*Convolvulaceae*, 24  
*Convolvulaceae*, 20

Class IV. *MUSC.*  
*Convolvulaceae*, 18  
*Convolvulaceae*, 64

Class V. *HYDROPHYL.*  
*Convolvulaceae*, 71  
*Convolvulaceae*, 71  
*Convolvulaceae*, 71

Class VI. *FRUIT.*  
*Convolvulaceae*, 78  
*Convolvulaceae*, 78  
*Convolvulaceae*, 77

Class VII. *LYCOPODI-*  
*ACEAE.*  
*Convolvulaceae*, 60

Class VIII. *GONIOPE-*  
*THES.*  
*Convolvulaceae*, 26  
*Convolvulaceae*, 61

Class IX. *GLUMACE.*  
*Convolvulaceae*, 106  
*Convolvulaceae*, 117

Class X. *JUNCINE.*  
*Convolvulaceae*, 121  
*Convolvulaceae*, 191  
*Convolvulaceae*, 187  
*Convolvulaceae*, 188

Class XI. *ENSATE.*  
*Convolvulaceae*, 171  
*Convolvulaceae*, 160  
*Convolvulaceae*, 161  
*Convolvulaceae*, 160  
*Convolvulaceae*, 165  
*Convolvulaceae*, 147

Class XII. *LILIACE.*  
*Convolvulaceae*, 200  
*Convolvulaceae*, 198  
*Convolvulaceae*, 215  
*Convolvulaceae*, 214

Class XIII. *ORCHIDE.*  
*Convolvulaceae*, 173

Class XIV. *SCITAMI-*  
*NEAE.*  
*Convolvulaceae*, 165  
*Convolvulaceae*, 168  
*Convolvulaceae*, 163

Class XV. *PALEAE.*  
*Convolvulaceae*, 133

Class XVI. *ARISTE.*  
*Convolvulaceae*, 195

Class XVII. *HEMERA.*  
*Convolvulaceae*, 141  
*Convolvulaceae*, 192  
*Convolvulaceae*, 209  
*Convolvulaceae*, 208

Class XVIII. *HEMERA.*  
*CHARDEAE.*  
*Hydrocharitaceae*, 141

Class XIX. *ARISTE.*  
*CHURAE.*  
*Balanophoraceae*, 50  
*Cylindraceae*, 31  
*Asaraceae*, 702  
*Lauraceae*, 140

Class XX. *UTRICUL.*  
*Saururaceae*, 321  
*Piperaceae*, 346  
*Crotonaceae*, 319

Class XXI. *HYDROPHYL.*  
*Calanaceae*, 412  
*Nymphaeaceae*, 429  
*Nelumbaceae*, 414

Class XXII. *CONFERAE.*  
*Cycadaceae*, 223  
*Abietaceae*, 226  
*Cupressaceae*, 226  
*Taxaceae*, 229

Class XXIII. *AMENSA.*  
*CHURAE.*  
*Cuscutaceae*, 249  
*Myricaceae*, 250  
*Heliconiaceae*, 251  
*Cupuliferaceae*, 250  
*Ulmaceae*, 580

Class XXIV. *UTRICUL.*  
*Monardraceae*, 258  
*Asaraceae*, 269  
*Utricleae*, 269

Class XXV. *FRUIT.*  
*GINAE.*  
*Polycarpaceae*, 302  
*Nyctaginaceae*, 306

Class XXVI. *FRUIT.*  
*SAL.*  
*Lauraceae*, 305  
*Saururaceae*, 307  
*Escalloniaceae*, 307  
*Lythraceae*, 309  
*Phytolaccaceae*, 302

Class XXVII. *SAL.*  
*Saururaceae*, 304

Class XXVIII. *ARISTE.*  
*GATE.*  
*Plantaginaceae*, 612  
*Primulaceae*, 610  
*Globulariaceae*, 610  
*Dipsacaceae*, 609  
*Veronaceae*, 607

Class XXIX. *COMPOS.*  
*CHURAE.*  
*Calyceae*, 701  
*Synanthereae*, 702

Class XXX. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXI. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXIII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXIV. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXV. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXVI. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXVII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXVIII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XXXIX. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XL. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLI. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLIII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLIV. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLV. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLVI. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLVII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLVIII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class XLIX. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class L. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class LI. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class LII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class LIII. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class LIV. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class LV. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681  
*Convolvulaceae*, 681

Class LVI. *ARISTE.*  
*CHURAE.*  
*Convolvulaceae*, 681



Class LIII. MYRTINÆ.	Class LV. GRUINALES.	? Rhizophoræ, 538 Tropæolæ, 366	Diosmeæ, 469 Rutaceæ, 469 Zygophyllæ, 478 Aurantiaceæ, 457 Amyridæ, 459 Connaraceæ, 468 Cassuviæ, 465 ? Juglandæ, 292
Mimaceæ, 731 Melastomaceæ, 731 Myrtaceæ, 734	Geraniaceæ, 493 Linacæ, 485 Oxalidæ, 488	Class LVIII. TRICOCCEÆ.	
Class LIII. LAMPRO- PHYLLÆ.	Class LVI. AMPELIDÆÆ.	Stackhouseæ, 589 Euphorbiaceæ, 274 Empetræ, 285 Bruniaceæ, 785 Rhamnæ, 581 Aquifoliaceæ, 597 Pittosporæ, 441 Celastrinæ, 586 ? Hippocrateaceæ, 584 ? Staphyleaceæ, 381	Class LX. CALOPHYTÆ.
Carnellinæ, 396 Ternstroemiaceæ, 396 Chenaceæ, 486	Sarimentaceæ, 439 Leeaceæ, 439 Melicæ, 463 Celreleæ, 461	Class LIX. TEREBIN- THINÆ.	Pomaceæ, 559 Rosaceæ, 563 Dryadeæ, 563 Spiræaceæ, 563 Amygdalæ, 557 Chrysobalanæ, 542 Papilionaceæ, 544 Swartzieæ, 544 Cæsalpinæ, 544 Mimoseæ, 544
Class LIV. COLUMNI- FERÆ.	Class LVII. MALPIG- HINÆ.		
Tiliaceæ, 371 Sterculiaceæ, 369 Bottanaceæ, 363 Hernandiaceæ, 363 Bombacaceæ, 393 Malvaceæ, 368	Malpighiaceæ, 385 Acerinæ, 387 Coriariæ, 475 Erythroxyleæ, 391 Sapindaceæ, 382 Hippocastaneæ, 382	Ochnaceæ, 474 Simarubæ, 476 Zanthoxyleæ, 472	

1830. LINDLEY, JOHN.—(*An Introduction to the Natural System of Botany, &c.*)

This was a slight modification of De Candolle's plan, with the apetalous and polypetalous plants thrown together, and consequently with a different sequence of the Natural Orders. No attempt was made at forming the minor groups, now called Alliances.

Class I. VASCULARES, or Flowering Plants.

Sub-class 1. Exogens or Dicotyledons.

Tribe 1. Angiospermæ.

§ 1. Polypetalous, apetalous, and achlamydeous plants.

§ 2. Monopetalous plants.

Tribe 2. Gymnospermæ.

Sub-class 2. Endogens or Monocotyledons.

Tribe 1. Petaloideæ.

Tribe 2. Glumaceæ.

Class II. CELLULARES, or flowerless plants.

Tribe 1. Filicoideæ; or Fern-like plants.

Tribe 2. Muscoideæ; or Moss-like plants.

Tribe 3. Aphyllæ; or Leafless plants.

1832. HESS, J.—(*Übersicht der Phanerogamischen natürlichen pflanzenfamilien mit einer kurzen charakteristik derselben.*)

This is essentially an imitation of the method of De Candolle, with some changes in the sequence of Orders. No attempt is made at forming groups higher than Natural Orders, and it cannot be said that the work has contributed to the progress of Natural classification. The great object of the author seems to have been to form a good series.

1832. SCHULTZ, Carl Heinrich.—(*Natürliches System des Pflanzenreichs nach seiner inneren organization.*)

In some respects this is like the system of De Candolle. The author first breaks up the Vegetable Kingdom into *Homorgana*, which have an exclusively cellular construction, and *Heterorgana*, which are formed with spiral vessels, and laticiferous vessels in addition. These are evidently the Cellular and Vascular plants of De Candolle. His *Heterorgana* he divides into *Synorgana* and *Dichorgana*, the first having all the forms of tissue dispersed through a common cellular mass, the latter having them separated in the form of bark and wood; *Synorgana* are therefore Endogens, and *Dichorgana* Exogens. The principal peculiarity consists in laticiferous vessels or cinenchyma being made a mark of classification, a certain number of flowering plants being thus combined with flowerless, under the name of *Homorgana florifera*; viz., Charads, Naiads, Hornworts, Podostemads, Seawracks, Hydrocharids, Lemnads, &c. Another peculiar feature is the formation among *Synorgana*, or Endogens, of a Class called *Synorgana dichorganoidea*, which is regarded as intermediate in nature between *Synorgana* and *Dichorgana*. This Class is divided into 2 groups, of which the first consists of Peppers, Samurads, and Chloranth, the second of Nyctagos, Waterstars, Hippurids, Amaranths, Cycads, Waterlilies, &c. The plan of this classification is as follows:—



Vascularia	Heterostachya	1. 1. sp. (Heterostachya)	—	I. Dicotyledonae	—
		2. 2. sp. (Heterostachya)	—	II. Dicotyledonae	—
	Symplocaria	1. 1. sp. (Symplocaria)	—	III. Dicotyledonae	—
		2. 2. sp. (Symplocaria)	—	IV. Dicotyledonae	—
	Dichrocarpa (Juncus) Dichrocarpa	1. 1. sp. (Dichrocarpa)	—	V. Dicotyledonae	—
		2. 2. sp. (Dichrocarpa)	—	VI. Dicotyledonae	—
		3. 3. sp. (Dichrocarpa)	—	VII. Dicotyledonae	—
		4. 4. sp. (Dichrocarpa)	—	VIII. Dicotyledonae	—
		5. 5. sp. (Dichrocarpa)	—	IX. Dicotyledonae	—
		6. 6. sp. (Dichrocarpa)	—	X. Dicotyledonae	—
		7. 7. sp. (Dichrocarpa)	—	XI. Dicotyledonae	—
		8. 8. sp. (Dichrocarpa)	—	XII. Dicotyledonae	—

1833. LINDLEY, John. (= *Nicotia P. nativus*).

This was an attempt, in imitation of Agardh and Bartling, to reduce the Natural Orders into groups subordinate to the higher divisions. Such groups were called *Nicotia* (tendencies). The author threw aside the distinctions between perigynous and hypogynous insertion as uncertain and leading to bad grouping; insisted upon the value of alliance as a primary character, and objected to the general principle that the sections of plants are to furnish their character, and not a character the section. Finally, he maintained that no sections are capable of being positively defined, except such as depend upon physiological peculiarities; and that all other collections of species, by whatever name they are known, whose distinguishing marks are dependent upon structure alone, merely exhibit tendencies to resemblance in certain points, for which tendencies definitions are impractical.

Keeping these principles in view, the following was the arrangement:—

Sexuales . . . . .	Vasculares . . . . .	Class I. ENOGENE.	Angiospermæ.

V. ESSENTIALES.

Class I. ENOGENE.

Subclass I. POLYPTALAE.

Cohort 1. ALLUMINÆ: embryo much smaller than the albumen.

N. 1. <i>Rubrales</i> .	Nelumbaceae	Schizandraceae	Escalloniaceae
Ranunculaceae	Cephaelaceae	Dilleniaceae	Burseraceae
§ Samolaceae	N. 2. <i>Albines</i> .	N. 3. <i>Umbellales</i> .	N. 5. <i>Umbellales</i> .
§ Ranunculaceae	Myrtaceae	Umbelliferae	Vitaceae
§ Ranunculaceae	Moraceae	Asteraceae	Phlogothaceae
§ Ranunculaceae	Wrightiaceae	N. 4. <i>Grasses</i> .	Oxalidaceae
§ Ranunculaceae	Asteraceae	Grassaceae	Dioscoreaceae

Cohort 2. GYNOSPERMÆ: carpels arranged round an elevated axis.

N. 1. <i>Rubrales</i> .	Zygophyllaceae	Trapaçaceae	N. 3. <i>Umbellales</i> .
Oleaceae	Nantheaceae	Celastraceae	Cappariaceae
Samolaceae	N. 2. <i>Grasses</i> .	Oxalidaceae	N. 4. <i>Grasses</i> .
Rutaceae	Hydrocharitaceae	Passifloraceae	Limnaceae
§ Dioscoreae			

Cohort 3. FLOSCING: every interior, generally with an epigynous disk.

N. 1. <i>Umbellales</i> .	Sileneae	Primulaceae	N. 4. <i>Umbellales</i> .
Oxalidaceae	N. 2. <i>Myrtales</i> .	N. 5. <i>Umbellales</i> .	Cappariaceae
§ Oxalidaceae	Myrtaceae	Hamamelidaceae	Convolvulaceae
§ Oxalidaceae	Myrtaceae	Convolvulaceae	Hamamelidaceae
§ Oxalidaceae	Myrtaceae	Hamamelidaceae	Hamamelidaceae
§ Oxalidaceae	Myrtaceae	Hamamelidaceae	Hamamelidaceae

Cohort 4. PANGYTALES: placenta parietal.

N. 1. <i>Umbellales</i> .	N. 2. <i>Umbellales</i> .	N. 3. <i>Umbellales</i> .	N. 4. <i>Umbellales</i> .
Cucurbitaceae	Vasculares	Papilionaceae	Burseraceae
Cappariaceae	Solanaceae	Papilionaceae	
Resedaceae	Moraceae	Hamamelidaceae	
	Passifloraceae	Hamamelidaceae	
	Hamamelidaceae	Hamamelidaceae	

Cohort 5. CALYCOSÆ: calyx incompletely whorled, two of the upper free.

N. 1. <i>Umbellales</i> .	N. 2. <i>Umbellales</i> .	Hypericaceae	Celastraceae
Guttiferæ	Fernstroemiae	Passifloraceae	Celastraceae
Rhinobolæ	N. 3. <i>Umbellales</i> .	Vasculares	Hamamelidaceae
Marasmiaceae	Asteraceae	N. 4. <i>Umbellales</i> .	N. 5. <i>Umbellales</i> .
Hypericaceae	Sapindaceae	Hamamelidaceae	Hamamelidaceae



Cohort 6. **SYNGAMERÆ** : carpels consolidated, and none of the characters of the other Cohorts.

N. 1. <i>Melastomales</i> .	Coleceæ	Nitrariaceæ	§ Staphyleaceæ
Stemmateaceæ	Hamulaceæ	Bursaceæ	Malpighiaceæ
Melastomaceæ	Aurantaceæ		§ Erythroxyleæ
Ericaceæ	Spondiaceæ	N. 4. <i>Euphorbioides</i> .	N. 5. <i>Silenales</i> .
Urticeæ		Euphorbiaceæ	Portulacaceæ
Dipterocarpaceæ	N. 3. <i>Rhamnoides</i> .	Stackhousiæ	Sileneæ
	Rhamnaceæ	Pongamiaceæ	Alsineæ
N. 2. <i>Melastomales</i> .	Chailletaceæ	Celastrineæ	Tamariscineæ
Melastomaceæ	Tremandraceæ	§ Hippocrateaceæ	Illecebreæ

Cohort 7. **APOCARPERÆ** : carpels distinct, or separable, or solitary, and none of the preceding characters.

N. 1. <i>Rosales</i> .	§ Swartziaceæ	N. 2. <i>Saxales</i> .	N. 4. <i>Crassales</i> .
Rosaceæ	§ Rosalpinieæ	Baueriaceæ	Crassulaceæ
§ Pomaceæ	§ Myricaceæ	Canoniaceæ	Galacineæ
§ Sanguisorbaceæ	Commataceæ	Saxifragæ	N. 5. <i>Balsamales</i> .
§ Amygdalaceæ	Chrysobalanaceæ	N. 3. <i>Ficoidales</i> .	Amyridæ
Leguminosæ	Calycanthaceæ	Ficoideæ	Anacardiaceæ

### Sub-class II. INCOMPLETÆ.

Cohort 1. **TUBERULÆ** : calyx tubular, often like a corolla, without the characters of the other Cohorts.

N. 1. <i>Santalales</i> .	Tymelaceæ	N. 3. <i>Proteales</i> .	Cassytheæ
Santalaceæ	Hernandiaceæ	Proteaceæ	N. 5. <i>Penæales</i> .
N. 2. <i>Daphnoides</i> .	Aquilaraceæ	N. 4. <i>Laureales</i> .	Penæaceæ
Elæagnaceæ		Lauraceæ	

Cohort 2. **CURVEMBRYÆ** : embryo curved round albumen, or horseshoe-formed, or spiral ; calyx rarely tubular.

N. 1. <i>Chenopodioides</i> .	N. 2. <i>Polygonoides</i> .	N. 4. <i>Sclerolales</i> .	N. 5. <i>Cocculales</i> .
Amaranthaceæ	Polygonaceæ	Scleranthaceæ	Menispermæ
Chenopodiaceæ	N. 3. <i>Petivales</i> .	Nyctagineæ	
Phytolacæ	Petiveriaceæ		

Cohort 3. **RECTEMBRYÆ** : calyx very imperfect ; embryo straight.

N. 1. <i>Amentales</i> .	§ Ceratophylleæ	Juglandæ	N. 5. <i>Datiscales</i> .
Caprifloræ	§ Artocarpææ	N. 3. <i>Casuariales</i> .	Datisceæ
Heliconiæ	Stilagineæ	Casuarineæ	Lacistemeæ
N. 2. <i>Urticales</i> .	Empetræ	N. 4. <i>Uinales</i> .	
Urticeæ	Myricæ	Ulmaceæ	

Cohort 4. **ACHLAMYDÆ** ; both calyx and corolla deficient.

N. 1. <i>Piperates</i> .	N. 2. <i>Salicinates</i> .	N. 3. <i>Monimiales</i> .	N. 4. <i>Podostemales</i> .
Chlorandraceæ	Salicinæ	Monimieæ	Podostemeæ
Saururæ	Platanæ	Atherospermæ	N. 5. <i>Callitralles</i> .
Piperaceæ	Balsamifereæ		Callitrichineæ

Cohort 5. **COLUMNIFERÆ** ; stamens monadelphous.

N. 1. <i>Nepenthales</i> .	N. 2. <i>Aristolochiales</i> .
Nepenthereæ	Aristolochiæ

### Sub-class III. MONOPETALÆ.

Cohort 1. **POLYCARPÆ** : hypogynous (rarely epigynous) with a polycarpous ovary.

N. 1. <i>Breviales</i> .	Epacridæ	Ebenaceæ	N. 5. <i>Voltales</i> .
Breviaceæ	N. 3. <i>Primulales</i> .	§ Styaceæ	Cuscutæ
N. 2. <i>Fricales</i> .	Primulaceæ	Illiciæ	Convolvulaceæ
Pyrolaceæ	Myrsinæ	N. 4. <i>Nolanales</i> .	Polemoniaceæ
Utriculæ	Sapotæ	Nolanaçæ	Hydrocleæ
Vacciniæ			

Cohort 2. **EPIGYNÆ** : epigynous, with a 2- or many-celled ovary.

N. 1. <i>Campanales</i> .	N. 2. <i>Goodeniales</i> .	N. 3. <i>Cinchonales</i> .	N. 4. <i>Capriales</i> .
Cobeliaceæ	Stylidæ	Cinchonaceæ	Caprifoliaceæ
Campanulaceæ	Goodenovieæ	Lygodysodiaceæ	
§ Balaniceæ	Scævoleæ		N. 5. <i>Stellales</i> .
Columelliaceæ			Stellatæ

Cohort 3. **DICARPÆ** : hypogynous, regular-flowered, with a dicarpous ovary.

N. 1. <i>Gentianales</i> .	N. 2. <i>Oleales</i> .	Potaliaceæ	Cordiaceæ
Gentianeæ	Oleaceæ	N. 4. <i>Echiales</i> .	Hydrophyllæ
Spæcæneæ	Jasminæ	Boraginæ	N. 5. <i>Solanales</i> .
Apocynæ	N. 3. <i>Loganiæ</i> .	Elætriaceæ	Solanæ
Asclepiadæ	Loganiaceæ	§ Meliotropiceæ	Cestrineæ



Class I. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

N. 1. <i>Epipetala</i> .	N. 2. <i>Polypetalæ</i> .	N. 3. <i>Polypetalæ</i> .	N. 4. <i>Polypetalæ</i> .
Epipetala.	Epipetala.	Epipetala.	Epipetala.
Epipetala.	Epipetala.	Epipetala.	Epipetala.
Epipetala.	Epipetala.	Epipetala.	Epipetala.

Class II. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

N. 1. <i>Polypetalæ</i> .	N. 2. <i>Polypetalæ</i> .	N. 3. <i>Polypetalæ</i> .	N. 4. <i>Polypetalæ</i> .
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.

Class III. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

Polypetalæ.  
Epipetala.  
Polypetalæ.  
Epipetala.

Class IV. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

Cohort 1. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

N. 1. <i>Polypetalæ</i> .	N. 2. <i>Polypetalæ</i> .	N. 3. <i>Polypetalæ</i> .	N. 4. <i>Polypetalæ</i> .
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.

Cohort 2. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

Polypetalæ.  
Epipetala.  
Polypetalæ.

Cohort 3. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

N. 1. <i>Polypetalæ</i> .	N. 2. <i>Polypetalæ</i> .	N. 3. <i>Polypetalæ</i> .	N. 4. <i>Polypetalæ</i> .
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.

Cohort 4. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

N. 1. <i>Polypetalæ</i> .	N. 2. <i>Polypetalæ</i> .	N. 3. <i>Polypetalæ</i> .	N. 4. <i>Polypetalæ</i> .
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.

Cohort 5. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

Polypetalæ.  
Epipetala.  
Polypetalæ.  
Epipetala.  
Polypetalæ.  
Epipetala.

Class V. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

Polypetalæ.  
Epipetala.  
Polypetalæ.  
Epipetala.

Class VI. *Polypetalæ*; *Epipetala*; *Polypetalæ*; *Epipetala*.

N. 1. <i>Polypetalæ</i> .	N. 2. <i>Polypetalæ</i> .	N. 3. <i>Polypetalæ</i> .	N. 4. <i>Polypetalæ</i> .
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.
Polypetalæ.	Polypetalæ.	Polypetalæ.	Polypetalæ.



1834. HORANINOW, Paul.—(*Primæ linæ Systematis Naturæ, nexui naturali omnium evolutionique progressivæ per nexus nascentes superstructi.*)

Here the Vegetable Kingdom is divided into 4 Circles, viz.—

- Circle 1. Sporophoræ (or Acotyledons).  
 2. Pseudospermæ containing Gymnosperms and Rhizanthis).  
 3. Cocophoræ (or Monocotyledons).  
 4. Spermophoræ (or Dicotyledons).

Each of these is broken up into classes. Water-lilies, Sarraceniads, Peppers and their allies, with Nepenthes, are placed in the third circle; while Cisturapes and Taceads stand in the fourth. The classes are in some instances extremely large, as, for example, the *Thalamopetalæ*, which contain 38 Orders, and are the equivalent of the *Thalamifloræ* section of De Candolle. By this author, as by some of the German Naturalists, Fungals and Algae are expelled from the Vegetable Kingdom, and form a part of a kingdom of Phytozoa; for Mr. Horaninow divides the organic world into Vegetables, Phytozoa, Animals, and Man.

1835. FRIES, Elias.—(*Corpus Florarum provincialium Sueciæ.*)

In this work the author has given a general scheme of arrangement according to his own peculiar views, and has applied it to the Flora of Scania. He prefaces his plan with an exposition of his ideas as to the manner of constructing a Natural System, and, among other things, maintains that it is more likely to be perfected by a small number of good observations clearly expressed than by a multitude of them. He regards germination as the first in rank of all the phases of vegetable life, manner of growth second, of flowering third, and of fruiting lowest of all, observing that the latter is the last stage of metamorphosis, beyond which there is nothing but the seed, whose constitution has nothing to do with that of the fruit. The seed is the beginning of germination. He regards the fruit as of importance in distinguishing Orders, and employs three forms of it, to which paramount importance is assignable. These are 1, simple, with a central placenta; 2, apocarpous, with the carpels disjoined; and 3, syncarpous, in which the carpels are all consolidated. The first he divides into *a*, with one stigma, and *b*, with two or more stigmas. The following is the general plan of his system, in which those numbers and letters have the value just assigned to them.

#### Class I. DICOTYLEDONS.

† Perianth genuine, complete, with a thickened disk for the insertion of the petals and stamens.  
 Stamens inserted,

##### A. on the Corolla. I. COROLLIFLORÆ.

<i>a. epigynous.</i>		<i>b. amphigynous.</i>	<i>c. hypogynous.</i>
I. SEMINFLORE.		II. ANNULIFLORE.	III. TUBIFLORE.
1. <i>a. Symplocaræ</i>		1. <i>a. Campanulacæ</i>	1. <i>a. Solanacæ</i>
		<i>b. Gesneriæ</i>	<i>b. Personatæ</i>
		<i>Polemoniaceæ</i>	<i>Gentianæ</i>
2. <i>b. Valerianæ</i>		2. <i>Boraginæ</i>	2. <i>Asclepiadæ</i>
3. <i>Rubiacæ</i>		<i>Labiata</i>	3. <i>Primulacæ</i>
3. <i>Caprifoliacæ</i>		3. <i>Hydrocaryæ</i>	

##### B. on the Receptacle. II. THALAMIFLORE.

<i>a. epigynous.</i>	<i>b. amphigynous.</i>	<i>c. hypogynous.</i>
IV. DISCIFLORE.	V. BASIFLORE.	VI. COLUMNIFLORE.
1. <i>a. Cistaceæ</i>	1. <i>a. Berberidæ</i>	1. <i>a. Cistinæ</i>
<i>b. Cistaceæ</i>	<i>b. Crucifera</i>	<i>b. Tillacæ</i>
<i>Melastomacæ</i>	<i>Papaveracæ</i>	<i>Hypericinæ</i>
2. <i>a. Aralacæ</i>	2. <i>a. Nymphiacæ</i>	2. <i>a. Grunales</i>
<i>b. Umbellifera</i>	<i>b. Ranunculacæ</i>	<i>b. Malvacæ</i>
3. <i>Loranthæ</i>	3. <i>Ranunculæ</i>	3. <i>Caryophyllæ</i>

##### C. on the Calyx. III. CALYCIFLORE.

<i>a. epiperigynous.</i>	<i>b. amphigynous.</i>	<i>c. hypogynous.</i>
VII. FAUCIFLORE.	VIII. TORIFLORE.	IX. CENTRIFLORE.
1. <i>a. Calycanthæ</i>	1. <i>a. Leguminosæ</i>	1. <i>a. Ericinæ</i>
<i>b. Ranunculæ</i>	<i>Drupacæ</i>	<i>b. Empetræ</i>
<i>Rubiacæ</i>	<i>b. Pomacæ</i>	<i>Aquifoliacæ</i>
<i>Succulacæ</i>	2. <i>Senticosæ</i>	2. <i>Euphorbiacæ</i>
2. <i>Portulacacæ</i>	3. <i>Paronychiæ</i>	3. <i>Polygonæ</i>
		<i>Chenopodæ</i>







1836. BROMHEAD, Sir E. French, Bart.

This author's system first appeared in the *Edinburgh Journ. Agr.* 1836, and has since been more than once revised to embrace the later discoveries of the science. The last published revision was in the *Mag. Nat. Hist. July*, 1840. The writer proposes to proceed wholly by induction. The families are collected into Alliances, designated by a termination in *ales*, from some characteristic or well-known family contained in the assemblage. Each family is placed in that Alliance in which it may meet the greatest number of families of admitted affinity to it, the character being subsequently deduced from the assemblage so constituted, and used as a test of admissibility in the more doubtful cases. — See *Mag. Nat. Hist. April*, 1838. A sketch of characters for the whole series of Alliances as they stood in 1838 appeared in the *Edinb. Phil. Journ. April and July* of that year. He considers it an advantage that above 60 of his Alliances are to be found indicated or adopted with more or less accuracy by other Botanists. He has given some of these synonyms in the *Phil. Mag. July*, 1837, and in the *Mag. Nat. Hist. July*, 1840. The author arranges with great care the contents of each Alliance in the order of the immediate affinities and transitions, and then places each Alliance between the two Alliances into which it passes. He considers himself to have thus established by induction a continuous series of Alliances, commencing with Algae and ending with Fungals, in which each family in a continuous succession stands between the two families of nearest affinity. The system thus resulting presents the aspect of two parallel races meeting in the Rhizanth, and presenting in their progress, at equal distances from the commencement, analogous Alliances, such, for instance, as Rosales and Fabales, Boraginales and Lamiales, Geraniales and Rutales, &c. In the Alliances, and in the grouping of the Alliances, the system accords with the quinary method; but to this the author does not bind himself, remarking that quinary combinations very frequently occur, and that he has extended them for the sake of convenience, by leaning towards that method in cases where the limits of families are ambiguous.

He considers the theory of the circulation of organic forms to be confirmed by his method, but does not look on them as closed or re-entering circles. He would rather compare them to the approach of the returning parts of a spiral or to the similarity of the opposite ends of a fusiform figure.

The subjoined table of his Alliances shows their succession, but the transitions and contents of the Alliances could not be exhibited without giving his tables at length.

## RACE OF THE ALGÆ.

- A.—Nostocales.
- B.—Fucales, rhodomelales, ulvales, charales, osmundales.
- C.—Ephedrales, myricales, ulmales, piperales, haloragales, œnotherales, myrtales, rosales, saxifragales, cucurbitales, portulacales, chenopodiales, polemoniales, boraginales, solanales, gentianales, apocynales, cinchonales, sambucuales, cornales, geraniales, cistales, brassicales, nymphaeales, aristolochiales.
- C. C.—Alismales, restiales, agrostidales, coccales, typhales.
- C. C. C.—Cytinales.

## RACE OF THE FUNGI.

- A.—Mucorales.
- B.—Auriculariales, lycoperdales, usneales, jungermanniales, lycopodiales.
- C.—Cupressales, betulales, rhamnales, euphorbiales, rescutales, hypericales, limoniales, fabales, violales, passiflorales, homaliales, eleagnales, acanthales, lamiales, rhinanthales, ericales, campanulales, asterales, dipsacales, myrsinales, rutales, malvales, laurales, magnoliales, menispermiales.
- C. C.—Asparagales, juncuales, orchidales, zingiberales, narcissales.
- C. C. C.—Cytinales.

1836. LINDLEY, John.—(*A Natural System of Botany, &c., second edition.*)

The arrangement here adopted was nearly the same as that proposed in the *Nixus Plantarum* (see p. xli.) An attempt was also made to reform the nomenclature of the Natural System, by making all the names of divisions of the same value end in the same way. The Orders were distinguished by ending in *aceæ*, the Sub-orders in *eæ*, the Alliances in *ales*, and certain combinations, called groups, in *osæ*. It was conceived that certain advantages and conveniences would attend the establishment of uniformity in these matters. Botanists do not, however, appear to be as yet disposed to entertain this opinion, and the terminations have not been generally adopted, in part, no doubt, because of the difficulty of adapting them to Greek and Latin compounds.

1836-1840. ENDLICHER, Stephen.—(*Genera Plantarum secundum ordines naturale disposita.*)

Upon this system has been published the most important systematical work that has appeared since the *Genera Plantarum* of Jussieu, in 1789. It commences with plants of the simplest kind, and closes with what the author regards as most complicated, viz., leguminous plants. It has been executed with great skill, but is too much dependent







## Section 5. ACRAMPHIBRYA.

Ulmaceæ, 580  
 Celtidaceæ, 580  
 Moraceæ, 266  
 Artocarpaceæ, 269  
 Urticaceæ, 260  
 Cannabaceæ, 265  
 Antidiomaceæ,  
 Platanaceæ, 272  
 Balsamiferae, 253  
 Salicaceæ, 264  
 Homaliumaceæ, 570  
 Laciniaceæ, 329

Class 27. *Oleraceæ*.

Chenopodiaceæ, 512  
 Amaranthaceæ, 510  
 Polygonaceæ, 502  
 Nyctaginaceæ, 505

Class 28. *Thymeleæ*.

Monimiaceæ, 298  
 Athoraspermeæ, 300  
 Lauraceæ, 305  
 Gyrocarpæ, 335  
 Santalaceæ, 787  
 Daphnoidæ, 530  
 Aquilariaceæ, 579  
 Illiciaceæ, 267  
 Penaceæ, 577  
 Proteaceæ, 532

Class 29. *Serpentaria*.

Aristolochiaceæ, 792  
 Nepenthaceæ, 287

## Cohort III. GAMOPETALÆ

Class 30. *Plumbaginæ*.

Plantaginaceæ, 642  
 Plumbaginaceæ, 640

Class 31. *Aggregatæ*.

Valerianaceæ, 697  
 Dipsacaceæ, 699  
 Compositeæ, 702  
 Calycetæ, 701

Class 32. *Campsnulineæ*.

Hemionidaceæ, 657  
 Goodeniaceæ, 644  
 Lobeliaceæ, 692  
 Campanulaceæ, 689  
 Stylidiaceæ, 686

Class 33. *Caprifolia*.

Rubiaceæ, 761  
 Lonicereæ, 766

Class 34. *Contortæ*.

Jasminaceæ, 650  
 Olacaceæ, 616  
 Loganiaceæ, 602  
 Strychnaceæ, 602  
 Apocynaceæ, 599  
 Asclepiadaceæ, 623  
 Gentianaceæ, 612  
 Symplocaceæ, 602

Class 35. *Nuculifera*.

Labiata, 659  
 Verbenaceæ, 663  
 Scitibineæ, 607  
 Globulariaceæ, 666  
 Solanaceæ, 666  
 Myoporaceæ, 665  
 Cordiaceæ, 628  
 Asperitoliæ, 655

Class 36. *Tubifloræ*.

Convolvulaceæ, 620  
 Polemoniaceæ, 635  
 Hydrophyllæ, 638  
 Hydroclaceæ, 638  
 Solanaceæ, 618

Class 37. *Personatæ*.

Serophulariaceæ, 681  
 Acanthaceæ, 678  
 Bignoniaceæ, 675  
 Gesneriaceæ, 671  
 Cyrtandraceæ, 671  
 Pedaliaceæ, 669  
 Orobanchæ, 609  
 Utriculariæ, 686

Class 38. *Petalanthæ*.

Primulaceæ, 644  
 Myrsinæ, 647  
 Sapotaceæ, 590  
 Ebenaceæ, 595

Class 39. *Bicornes*.

Epacridaceæ, 448  
 Ericaceæ, 453  
 Vacciniæ, 757

Cohort IV. DIALYPE-  
TALA.Class 40. *Discanthæ*.

Umbelliferæ, 773  
 Analiaceæ, 780  
 Ampelidæ, 439  
 Cornaceæ, 782  
 Loranthaceæ, 789  
 Hamamelidæ, 784  
 Bruniaceæ, 785

Class 41. *Corniculatæ*.

Crassulaceæ, 344  
 Saxifragaceæ, 567  
 Ribesiaceæ, 750

Class 42. *Polycarpicæ*.

Menispermaceæ, 307  
 Myristicaceæ, 301  
 Aponaceæ, 420  
 Selaginaceæ, 305  
 Magnoliaceæ, 417  
 Dielmaceæ, 423  
 Ranunculaceæ, 425  
 Berberidæ, 316

Class 43. *Rhades*.

Papavaceæ, 430  
 Cruciferae, 361

Capparidæ, 357  
 Resedaceæ, 356  
 Datisicæ, 316

Class 44. *Nelumbia*.

Nymphaeaceæ, 409  
 Sarraceniaceæ, 429  
 Cabombæ, 412  
 Nelumboneæ, 414

Class 45. *Parietales*.

Cistaceæ, 349  
 Droseraceæ, 433  
 Violaceæ, 338  
 Sauvagesiaceæ, 343  
 Frankeniaceæ, 340  
 Turneraceæ, 347  
 Samydaceæ, 330  
 Bixaceæ, 327  
 Homaliaceæ, 742  
 Passifloraceæ, 332  
 Malesherbiaceæ, 335  
 Loasaceæ, 744  
 Papayaceæ, 301

Class 46. *Peponifera*.

Nandhiroboæ, 311  
 Cucurbitaceæ, 311  
 Begoniaceæ, 318

Class 47. *Opuntia*.

Cactaceæ, 746

Class 48. *Caryophyllineæ*.

Mesembryaceæ, 525  
 Portulacaceæ, 500  
 Caryophyllæ, 496  
 Phytolaccaceæ, 509

Class 49. *Columnifera*.

Malvaceæ, 368  
 Sterculiaceæ, 360  
 Buttneriaceæ, 363  
 Tiliaceæ, 371

Class 50. *Guttifera*.

Dipterocarpaceæ, 393  
 Chimenaceæ, 486  
 Ternstroemiaceæ, 396  
 Clusiaceæ, 400  
 Marsegniaviaceæ, 403  
 Hypericaceæ, 405  
 Elatinaceæ, 480  
 Reaumuriaceæ, 407  
 Tamariscinæ, 341

Class 51. *Hesperidæ*.

Humiriaceæ, 447  
 Olacaceæ, 443  
 Aurantiaceæ, 457  
 Meliaceæ, 463  
 Cedrelaceæ, 461

Class 52. *Acera*.

Acerinæ, 387  
 Malpighiaceæ, 388  
 Erythroxyleæ, 391

Sapindaceæ, 382  
 Rhizoboleæ, 398

Class 53. *Polygalinæ*.

Tremandree, 374  
 Polygalæ, 375

Class 54. *Frangulaceæ*.

Pittosporæ, 441  
 Staphyleaceæ, 381  
 Celastrinæ, 586  
 Hippocrateaceæ, 584  
 Iliciæ, 579  
 Rhamnæ, 581  
 Chailletiacæ, 583

Class 55. *Tricoccæ*.

Empetreæ, 285  
 Stackhousiaceæ, 589  
 Euphorbiaceæ, 274

Class 56. *Terebinthinæ*.

Juglandæ, 292  
 Anacardiaceæ, 465  
 Burseraceæ, 459  
 Connaraceæ, 466  
 Ochnaceæ, 474  
 Simarubaceæ, 476  
 Xanthoxyleæ, 472  
 Diosmeæ, 469  
 Rutaceæ, 469  
 Zygophyllæ, 478

Class 57. *Gruinales*.

Geraniaceæ, 493  
 Linææ, 485  
 Oxalidæ, 488  
 Balsaminæ, 490  
 Tropæolæ, 366  
 Linumnantheæ, 366

Class 58. *Calycifloræ*.

Vochysiaceæ, 379  
 Combretaceæ, 717  
 Alangieæ, 719  
 Rhizophoreæ, 726  
 Philadelphææ, 753  
 Enothereæ, 724  
 Haloragæ, 722  
 Lythariæ, 754

Class 59. *Myrtifloræ*.

Melastomaceæ, 731  
 Myrtaceæ, 734

Class 60. *Rosifloræ*.

Pomaceæ, 559  
 Calycanthææ, 540  
 Rosaceæ, 563  
 Amygdalææ, 557  
 Chrysobalanææ, 542

Class 61. *Leguminosæ*.

Papilionaceæ, 544  
 Swartzieæ, 544  
 Mimoseæ, 544

1833. LINDLEY, John.—(Article "*Exogens*" in the *Penny Cyclopaedia*.)

In this place the author's views, as explained in previous works, were considerably modified so far as regards *Exogens*. He proposed in the first place to abandon altogether the old divisions of Polypetalous, Monopetalous, and Apetalous plants, and to reconstruct the whole fabric of *Exogenous* classification, upon the following principles:—

In the first place, the Orders whose embryo is furnished with an excessive quantity of albumen (a great physiological distinction), were formed into an Albuminous group. — The remainder of *Exogens* then consists of Orders in which some have the sexes



in distinct flowers, and others hermaphrodite flowers. As we know of no instance intimately connected with the reproduction of the species which is upon the whole so important as this, a Dicotyledon group was established, as had formerly been done by Jussieu. — The hermaphrodite Orders were then separated into those with the corolla corolla, and stamens confluent at the base with each other and with the ovary, those having an inferior ovary, and those in which those parts are distinct, either separate, or at least from each other, the former constituting an *Entomophyta* group. — Finally, the remainder of the Orders were divided into those with a reproductive function combined with an ovary upon a binary plan (Dicarpous), and those which, if *heterostylous*, have the ovary simple or complex (Polycarpous).

The following table will put this in a clearer point of view:

Alumina extremely abundant, crystals faintly	1. Aluminous
Alumina absent, or in trace (rarely)	
Seems to be extra glass	
Ovary cellular	2. Ferrous (?)
Ovary solid	
1-ovary, if present, ovary joint with a dicarpous ovary	3. Ferrous (?)
Fluorescent brownish, with a dicarpous ovary	4. Dark green (?)
Seems to be extra glass	5. Ferrous (?)

Each of these groups would form a series by itself, the sequence of which might be (natural), and to exhibit various lateral analogies with other groups. And thus (of them) Monopetalous, Apetalous, and Polypetalous divisions were exchanged for five others founded upon totally different principles. It will be seen that this scheme has been partly adopted in the present volume.

1933. PARLER, C. J.—(*Clupea*) *Clupea edwardsi* and *justiflorae*, and *Ichthys* *gwynn* *viridis* *occidentalis*.

This author admits nine Classes, each of which is subdivided into 46 Orders, which are themselves the equivalents of Alliances, and under these are arranged the Natural Orders, which he calls Families. Professor Tusch states that most of the Alliances employed in this book were proposed by him in his work entitled *Le Naturalesche des Palmaria*, published in 1826, which I have not seen.

The *Clavis* deserves to be studied. The Alliances are often well constructed, but not having the genera arranged under them, they are extremely troublesome to use; and this is no doubt the reason why the work has attracted so little notice among British. Sir Edward Bromhead has analysed it (*Magn. Nat. Hist., vol. viii., 1891, p. 100*), and speaks of it as "a work of very great value." Professor Perdik's *Classes* are the following:—

Cellular or Acetylenes	<i>Tridax</i> (usually with thallus) fruit imperfect . . . . . I. <i>Phanerochaete</i> <i>Tridax</i> fruit perfectly imperfect . . . . . II. <i>Mosses</i>			
Endemic or Monocytidens	<i>Phyllostachys</i> . . . . . III. <i>Phyllostachys</i> <i>Phyllostachys</i> + <i>Phyllostachys</i> . . . . . IV. <i>Phyllostachys</i>			
Vaccinaria or Cyathodens	Paranth singly, often monanth, sometimes 0. . . . . V. <i>Mosses</i> (mostly 0)	Corolla hypocyrtous . . . . . VI. <i>Tridax</i> (mostly 0)		
			Corolla monopetalous	Corolla perigynous . . . . . VII. <i>Phanerochaete</i>
			Corolla perigynous . . . . . IX. <i>Phanerochaete</i>	Corolla perigynous . . . . . X. <i>Phanerochaete</i>

1839. LINDLEY, John. — (*Patented Register*, p. 77, *Musical and Musical*)

On this occasion the author directed his attention to an extension of the Classes of plants, which he proposed to raise to 3, in the following manner:

## STATE I. SYSTEM OF FLOWERING PLANTS.

Division 1. Exogens.	<i>Chalcididae</i> .	<i>Chalcid</i> 1	<i>Exochus</i> 1
		<i>Chalcid</i> 14	<i>Exochus</i> 1
		<i>Chalcid</i> 111	<i>Exochus</i> 1
		<i>Chalcid</i> 14	<i>Exochus</i> 1
Division 2. Endogens.	<i>Spilidae</i> .	<i>Spila</i> 1	<i>Spila</i> 1
		<i>Spila</i> 1	<i>Spila</i> 1
		<i>Spila</i> 1	<i>Spila</i> 1
		<i>Spila</i> 1	<i>Spila</i> 1

## STATE II. Extension of Uncovered Plants

Division 3. Acrogens. — 

Class VII	Composites
Class VIII	Polymers

To what extent these views can be sustained I will be concerned in the present volume.



1839. BASKERVILLE, Thomas.—(*Affinities of Plants, with some Observations upon Progressive Development.*)

The author of this tract was a very young man, with little experience; but he possessed strong perceptive powers, and would doubtless have distinguished himself had life been spared to him. But he died almost as soon as his little book saw the light. In the main he adopted the scheme of Orders in the *Nicus Plantarum*, p. xli.; but he criticised that arrangement with some skill, and avoided many of its worst errors. Baskerville's main purpose was to establish a theory of progressive development in the Vegetable Kingdom, and to show by maps and other schemes all existing affinities. The following observations deserve to be quoted:—

"Before we endeavour to establish any plan of affinity, it will be necessary to make a few observations upon a subject bearing closely upon that, namely, the respective rank or dignity of plants, and the means we possess of ascertaining the same. That this is no easy matter will appear when we reflect that imperfection is impossible in any work of supreme intelligence: our ideas of one plant having a station above that of another will not be drawn from any positive defect observable in the lowest, but from excellency we fancy to discover in the higher being. A Moss or Lichen is as perfectly fitted to the conditions it is intended to fulfil, and its organs as completely adapted to that purpose as the stately Palm, or magnificent forest tree. To imagine one plant, therefore, more noble than another, we merely imply that we consider its organisation, either by its complexity or some other character, to raise the plant possessing such qualifications above the surrounding species. When our investigations are confined to plants upon, or nearly upon, the same level, the problem is so intricate that it scarcely admits of solution; but when we take species separated by a long interval, the sum of additional properties enables us to decide with more certainty; yet the amount of difference is so trifling, and probably so exquisitely compensated for, that the balance is by no means so great as might be expected. In consequence of this it does not appear that any one has as yet been able to suggest what ought properly to be considered as the highest kind of plant; and the same difficulty would occur with regard to the lowest, were it not decided by the degree of proximity to the animal kingdom.

"It will be seen, therefore, that this kind of study is essentially comparative, and our proper attainment of it dependent upon the extent of our acquaintance with the vegetable species and their organisation, and on a proper interpretation of the importance of the characters which we construct from these, which, as character scarcely ever maintains an equal value in all its relations, lays open another source of difficulty."—p. 39.

1841. TRAUTVETTER, Ernst Christian.—(*De Novo Systemate Botanico.*)

This is a speculative disquisition upon the philosophical way of classing plants. The author begs that he may be understood to have executed his task not like a Botanist, but like a philosopher (non botanico sed philosophico munere perfungi). He divides the Vegetable Kingdom into *semi-plants* and *true plants*; the former into *Favi* or *Acotyledons*, and *Trunculi* or *Monocotyledons*; and the latter into *Herbs* and *Trees*. The views of the author cannot be given better than in his own words:—"Flagrant nature venatores nova semper et incognita visendi cupiditate. Nos vero antiquitatis alumni aliter sumus affecti." The treatise will be found in the *Bulletin de la Société Impériale des Naturalistes de Moscou*, 1841, p. 509.

1843. BRONGNIART, Adolphe.—(*Énumération des Genres de Plantes cultivés au Muséum d'Histoire Naturelle de Paris, suivant l'Ordre établi dans l'école de Botanique en 1843.*)

The apetalous division of Jussieu is abandoned on the ground that the Orders belonging to it are an imperfect state of polypetalous Orders, (called after Endlicher diadypetalous). The impracticability of a lineal natural arrangement is insisted upon. Rules are to be formed upon *à posteriori* not *à priori* considerations. Albumen is regarded of high value, especially the difference between farinaceous albumen, and that which is fleshy, oily, and horny, which last are taken to be slight modifications of each other. Finally, the direction of the embryo is regarded of more importance in its relation to the pericarp than to the hilum. The following are the details of the system:—

Division 1. CRYPTOGAMÆ. No sexual organs, &c.

Branch 1. AMPHIGENÆ. No distinct axis or appendages, &c.

Branch 2. AEROGENÆ. Distinct axis and appendages, &c.

Division 2. PHANEROGAMÆ. Sexual organs evident, &c.

Branch 3. MONOCOTYLEDONS. Embryo with one cotyledon, &c.

Ser. 1. *Albuminosæ*. Albumen.

Ser. 2. *Exalbuminosæ*. No albumen.







Ser. 2. *DIALYPETALÆ*.

§ 1. *Hypogynæ*.

† Flowers complete.

A. Calyx permanent.

Polystemonaceæ.

Class 30. *Guttiferae*.

Clusiaceæ, 400

Marcgraviaceæ, 403

Hypericaceæ, 405

Reaumuriaceæ, 407

Tamariscinæ, 341

Cistaceæ, 349

Boxaceæ, 327

Ternstroemiaceæ, 396

Chenaceæ, 486

Dipterocarpeæ, 393

Class 31. *Malvaceæ*.

Tiliaceæ, 371

Malvaceæ, 368

Sterculiaceæ, 360

Buttneriaceæ, 363

\*\*\* Oligostemonaceæ.

Class 32. *Crotonaceæ*.

Antidesmeæ, 259

Forestiereæ, 283

Euphorbiaceæ, 274

Class 33. *Polygalinæ*.

? Tremandree, 374

Polygalæ, 375

Class 34. *Geraniaceæ*.

Balsaminæ, 490

Tropæoleæ, 396

Geraniaceæ, 493

? Limnantheæ, 396

? Comariaceæ, 474

Linææ, 485

Oxalidæ, 488

Zygophyllæ, 478

Class 35. *Terebinthinæ*.

Rutaceæ, 469

Diosmeæ, 469

Ochnaceæ, 474

Simarubæ, 476

Xanthoxyleæ, 472

Anacardiæ, 465

? Connaraceæ, 468

Class 36. *Hesperidæ*.

Burseraceæ, 459

Aurantiacæ, 457

Cedreleæ, 461

Melastomæ, 463

Nimææ, 443

Nitrariaceæ, 388

? Humiriaceæ, (b4r) 447

Erythroxyleæ, 391

Class 37. *Æsculinæ*.

Malpighiaceæ, 388

Acérinæ, 387

Hippocastaneæ, 382

? Rhizophoræ, 398

Sapindaceæ, 382

Vochysiæ, 379

Class 38. *Celastraceæ*.

Viniferæ, 439

Hippocrateæ, 584

Celastraceæ, 586

Staphyleæ, 481

Pittosporæ, 441

Class 39. *Violinæ*.

? Samarasieræ, 343

Violaceæ, 338

Droseraceæ, 433

Frankeniaceæ, 340

B. Calyx deciduous.

\* Albumen none or thin.

Class 40. *Cruciferae*.

Rosellaceæ, 356

Capparidaceæ, 357

Cruciferae, 351

\*\* Albumen thick, fleshy, or horny.

Class 41. *Papaverinæ*.

Fumariaceæ, 435

Papaveraceæ, 430

Class 42. *Berberinæ*.

Berberidæ, 437

Lardizabaleæ, 303

Menispermaceæ, 307

Class 43. *Magnolinæ*.

Schizandree, 305

Myrticaceæ, 301

Anonaceæ, 420

Magnoliaceæ, 417

Class 44. *Ranunculinæ*.

Dilleniaceæ, 423

Ranunculaceæ, 425

? Sarraceniacæ, 429

\*\*\* Albumen double, the outer farinaceous.

Class 45. *Nymphaeaceæ*.

Nelumbonæ, 414

Nymphaeaceæ, 409

Cabombæ, 412

†† Flowers incomplete. Never a corolla.

Class 46. *Piperinæ*.

Saururæ, 521

Piperaceæ, 515

Class 47. *Urticinæ*.

Urticæ, 260

Artocarpæ, 269

Moreæ, 266

Celtidæ, 580

Cannabineæ, 265

Class 48. *Polygonaceæ*.

Polygonæ, 502

§ 2. *Perigynæ*.

† Embryo curved round farinaceous albumen.

Class 49. *Caryophyllinæ*.

Nyctaginæ, 506

Phytolaceæ, 509

Chenopodiæ, 512

Basellæ, 524

Amaranthaceæ, 510

Sileneæ, 496

Alsineæ, 496

Paronychiæ, 499

Portulacæ, 509

Class 50. *Cactoidæ*.

Mesembryanthemæ, 525

Cactæ, 746

†† Albumen fleshy or lorny.

Class 51. *Crassulinæ*.

Crassulaceæ, 344

Elatinæ, 480

Datisceæ, 316

Class 52. *Saxifraginæ*.

Francoaceæ, 451

Philadelphææ, 753

Saxifragaceæ, 567

Ribesie, 759

Class 53. *Passiflorinæ*.

Loasææ, 744

Papayaceæ, 321

Turneraceæ, 347

Mallesherbiæ, 335

Passifloreæ, 332

Samydææ, 330

Homalinææ, 742

Class 54. *Hamamelinæ*.

Platanæ, 272

Balsamitidæ, 253

Hamamelidæ, 784

Alangieæ, 719

Bruniaceæ, 785

Class 55. *Umbellinæ*.

Umbelliferæ, 773

Araliaceæ, 780

Cornææ, 782

? Garryaceæ, 295

Class 56. *Santalinæ*.

? Ceratophyllææ, 263

? Chloranthaceæ, 519

L. rantheæ, 789

S. ntalaceæ, 787

O. acineæ, 443

Class 57. *Asarinæ*.

? Balanophoreæ, 89

Rafflesiaceæ, 93

Cytinæ, 91

Nepentheæ, 287

Aristolochiaceæ, 792

†† Albumen 0, or little.

Class 58. *Cucurbitinæ*.

Begoniaceæ, 318

Nandirhobææ, 311

Cucurbitaceæ, 311

Gronovieæ, 744

Class 59. *Ænothereinæ*.

Haloragææ, 722

Ænothereæ, 724

Melastomaceæ, 731

Lythraceæ, 574

? Rhizophorææ, 726

Memecyleæ, 731

Combretaceæ, 717

? Myrtaceæ, 734

Class 60. *Daphnoidæ*.

Gyrocarpeæ, 535

Lauraceæ, 535

Hernandiaceæ, 535

Thymelaceæ, 539

Class 61. *Proteinæ*.

Proteaceæ, 532

Elæagnaceæ, 257

Class 62. *Rhamnoidæ*.

Penæaceæ, 577

Rhamnææ, 581

Stackhousieæ, 589

Class 63. *Myrtoideæ*.

Myrtaceæ, 734

Lecythidææ, 739

Granatææ, 734

? Calycanthææ, 540

? Monimieæ, 298

Class 64. *Rosinæ*.

Pomaceæ, 559

Neuradææ, 563

Spireææ, 563

Rosaceæ, 563

Amygdalææ, 557

Chrysobalanaceæ, 542

Class 65. *Leguminosæ*.

Papilionaceæ, }

Cæsalpinieæ, } 544

Mimosææ, }

? Moringææ, 536

Class 66. *Amentaceæ*.

Juglandææ, 292

? Salicinææ, 254

Quercinææ, 290

Betulineæ, 251

Myricææ, 256

Casuarinææ, 249

Sub-branch 2. *Gymnospermæ*.

Class 67. *Coniferæ*.

Gnetaceæ, 232

Taxinææ, 239

Cupressinææ, 226

Abietinææ, 226

Class 68. *Cycadoideæ*.

Cycadææ, 223







Class 28. <i>Styracineæ</i> .	Apocynaceæ, 599	Solanaceæ, 618	Pedaliaceæ, 669
Styracaceæ, 592	Asclepiadeæ, 623	Nolanaceæ, 654	Bignoniaceæ, 675
Ebenaceæ, 595	Class 30. <i>Tubifloræ</i> .	Erycibereæ, 595	Cyrtandraceæ, 671
Sapoteæ, 599	Cuscutæ, 623	Cedbiaceæ, 628	Gesneriaceæ, 671
Aquifoliaceæ, 597	Diapensiaceæ, 606	Ehretiaceæ, 653	Scrophularineæ, 681
Class 29. <i>Onoforta</i> .	? Retziaceæ, 618	Borragineæ, 655	Stilbaceæ, 607
Roussaceæ	Polémoniaceæ, 635	Class 31. <i>Labiatifloræ</i> .	Myoporineæ, 665
Loasaceæ, 602	Hydrophylleæ, 638	Labiata, 659	Salazineæ, 666
? Gentianaceæ, 612	Convolvulaceæ, 639	Verbenaceæ, 633	Orobanchæ, 609
		Acanthaceæ, 678	Utriculariæ, 686
			Globulariæ, 666

## †† Monochlamyds.

Class 32. <i>Glyceræ</i> .	Phaleriæ	Class 36. <i>Julifloræ</i> .	Artocarpeæ, 269
Potivaceæ, 599	Aquilarinæ, 579	Cupulifereæ, 290	Treviaceæ, 274
Polygonaceæ, 592	Thymeleæ, 530	Gunneraceæ, 780	Cannabineæ, 265
Ericaceæ, 592	Hernandiaceæ, 530	Cymocarabæ	Betulaceæ, 251
Nyctagthaceæ, 595	Protocæ, 532	Garryaceæ, 295	Ulmaceæ, 589
Chapotaceæ, 512	Penaceæ, 577	Datisceæ, 31	Myricæ, 256
Amaranthaceæ, 519	Eleaganeæ, 257	Putranjivæ	Casuarineæ, 249
Phytolaceæ, 509	Myristiceæ, 301	Forestiereæ	
Class 33. <i>Daphnoidæ</i> .	Class 34. <i>Serpentariæ</i> .	Scapaceæ, 283	Class 37. <i>Piperinæ</i> .
Monardieæ, 298	Aristolochiaceæ, 792	? Henslowiaceæ, 569	Chloranthæ, 519
Atherospermæ, 300	Nepentheæ, 287	Lacistemeæ, 329	Piperaceæ, 515
Laurineæ, 555	? Saraceniæ, 429	Balsamiflueæ, 253	Saurureæ, 521
Gyrocarpeæ, 535	Class 35. <i>Tricocceæ</i> .	Platanæ, 272	Class 38. <i>Conifera</i> .
Grubbiaceæ	Begoniaceæ, 318	Antidesmeæ, 259	Gnetaceæ, 232
Nyssaceæ, 592	Euphorbiaceæ, 274	Salicineæ, 254	Cupressineæ, 226
Helwingiaceæ, 296	Stackhousiaceæ, 589	Batideæ, 286	Abietineæ, 226
Santalaceæ, 787	Limpetreæ, 289	Celtideæ, 580	Taxineæ, 230
Anthoboleæ		Urticaceæ, 260	Cycadeæ, 223
		Moreæ, 266	

## II. MONOCOTYLEDONS.

Class 39. <i>Rhizanthææ</i> .	Rutomeæ, 208	Iridæ, 159	Class 46. <i>Enantioblastæ</i> .
Balanophoreæ, 89	Hydrocharideæ, 141	Hæmodoraceæ, 151	Commelynacæ, 188
Cymosæ, 91	Class 42. <i>Gymandrea</i> .	Hypoxideæ, 154	Mayaceæ, 189
Rathlesnaceæ, 93	Orchideæ, 173	Amaryllideæ, 155	Xyrideæ, 187
Class 40. <i>Spadicifloræ</i> .	Apostasiæ, 184	Bromeliaceæ, 147	Eriocaulæ, 122
Palma, 131	Class 43. <i>Scitamineæ</i> .	Class 45. <i>Connarviæ</i> .	Restiaceæ, 121
Pandaneæ, 139	Zingiberaceæ, 165	Pontederaceæ, 206	Centrolepideæ, 120
Typhaceæ, 125	Cannaceæ	Liliaceæ, 200	Class 47. <i>Glumaceæ</i> .
Aroideæ, 127	Musaceæ, 163	Dioscoreaceæ, 214	Cyperaceæ, 117
Class 41. <i>Helobieæ</i> .	Class 44. <i>Ensatæ</i> .	Ophiopogoneæ, 200	Gramineæ, 106
Najadeæ, 143	Burmanniaceæ, 171	Taccææ, 149	
Alismaceæ, 209		Melanthaceæ, 198	
		Juncaceæ, 191	
		Philydreæ, 186	

## B. CELLULAR PLANTS.

## III. ACOTYLEDONS.

1843. HORASINOW, Paul.—(*Tetractys Naturæ, seu systema quadrimembre omnium naturalium*.)

In this work the views of the author, as expressed nine years before in his *Prima Linæ* (p. xliv.), are repeated with some modifications of detail. His 4th Circle, or Spermatophoræ, are called Euspermeæ, and the number of the Alliances, called Orders, much increased. They are, moreover, distinguished by the termination *astra*, as Rutastra, Araliastra, &c. No distinctive characters are proposed for any of the groups, so that means are not afforded by the learned author of judging of the principles which have guided him in the details of his classification.

1844. JUSSIEU, Adrien de.—(*Cours Élémentaire d'Histoire Naturelle: Botanique*.)

This little work contains all the Natural Orders of plants now admitted, arranged on the plan of Jussieu, by his son. It is therefore the most recent exposition of the views of the learned authors. In addition to the names, an analysis of their distinctive characters is introduced in the original, to which a student may be usefully referred. The arrangement is not however extracted, because it is merely artificial, and contrived for the purpose of finding a plant easily: in which respect it may be compared to the Artificial Analysis affixed to the present work.



1845. LINDLEY, John.—(*The Vegetable Kingdom*, &c.)

The following is the system employed in the present Work.—

## CLASSES.

*Second or Phanerogam Plants.*Stems and leaves indistinguishable.  
Stems and leaves distinguishable.I. THALLOGENS.  
II. ACROGENS.*Second or Phanerogam Plants.*Fructification springing from a thallus.  
Fructification springing from a stem.

III. RHIZOGENS.

Wood of stem youngest in the centre; cylindrical or annular.

IV. ENDOGENS.

Leaves parallel or twisted; petioles not; wood of the stem always continued in leaves and young branches; wood of the stem, when petioles are arranged in a circle with a central pith.

V. DICTYOGENS.

Wood of stem youngest at the circumference; always cylindrical; cylindrical.

VI. GYMNOGENS.

Seeds quite naked.

VII. EXOGENS.

Seeds inclosed in seed vessel.

## Class I. THALLOGENS.

## ALLIANCES OR THALLOGENS.

1. ALGALÆ.—*Cellular* (crystalline) plants, consisting of single cells or of a few cells united by their crystalline walls; fructification of very simple form; fructification of the mother; fructification of the mother.
2. FUNGALÆ.—*Cellular* (membranous) plants, consisting of single cells or of a few cells united by their membranous walls; fructification of very simple form; fructification of the mother; fructification of the mother.
3. LICHENALÆ.—*Crystalline* (crystalline) plants, consisting of single cells or of a few cells united by their crystalline walls; fructification of very simple form; fructification of the mother; fructification of the mother.

## NATURAL ORDERS OF THALLOGENS.

## Alliance 1. ALGALÆ, p. 8.

Crystalline, angular, fragmentary bodies, fructific, and multiplying by spontaneous separation.  
Vesicular, filamentary or membranous bodies, multiplied by zoospores, or contained in the interior at the expense of their gross matter.  
Cellular or tubular unsymmetrical bodies, multiplied by simple spores, or emitted externally.  
Cellular or tubular unsymmetrical bodies multiplied by zoospores.  
Tubular symmetrically branched bodies, multiplied by spiral coated nucleuses, filled with starch.

1. *Phormidium* or *Phormidium*, p. 1.
2. *Chloridium* or *Chloridium*, p. 14.
3. *Phormidium* or *Phormidium*, p. 20.
4. *Chloridium* or *Chloridium*, p. 20.
5. *Chloridium* or *Chloridium*, p. 20.

## Alliance 2. FUNGALÆ, p. 20.

Spores generally quadrate or distinct spore-phores. Hymenium naked.  
Spores generally quadrate or distinct spore-phores. Hymenium inclosed in a peridium.  
Spores single, often septate, or more or less distinct spore-phores. Floor of the fruit obsolete or more polulences.  
Spores naked, often septate. Thallus floccose.  
Sporidia continued (generally eight together) in asper.  
Spores surrounded by a vesicular wall, or sporangium. Thallus floccose.

6. *Hymenium* or *Hymenium*, p. 20.
7. *Hymenium* or *Hymenium*, p. 20.
8. *Hymenium* or *Hymenium*, p. 20.
9. *Hymenium* or *Hymenium*, p. 20.
10. *Hymenium* or *Hymenium*, p. 20.
11. *Hymenium* or *Hymenium*, p. 20.

## Alliance 3. LICHENALÆ, p. 40.

Nucleus breaking up into naked spores.  
Nucleus bearing aser, thallus homogeneous or reticulated or cartilaginous.  
Nucleus bearing aser; thallus heterogeneous, pulverulent or cellular.

12. *Hymenium* or *Hymenium*, p. 40.
13. *Hymenium* or *Hymenium*, p. 40.
14. *Hymenium* or *Hymenium*, p. 40.



## Class II. ACROGENS.

## ALLIANCES OF ACROGENS.

4. MUSCALES.—*Cellular (or vascular).* Spore-cases immersed or calyptrate (i. e. either plunged in the substance of the frond, or inclosed within a hood having the same relation to the spores as to involucre to a seed-vessel).
5. LYCOPODALES.—*Filicular.* Spore-cases axillary or radical, one or many-celled. Spores of two sorts.
6. FILICALES.—*Vascular.* Spore-cases marginal or dorsal, one-celled, usually surrounded by an elastic ring. Spores of but one sort.

## NATURAL ORDERS OF ACROGENS.

## ALLIANCE 4. MUSCALES, p. 54.

## 1. HEPATICÆ.

- |   |  |
|---|--|
| Spore-cases valveless, without operculum or elaters   | 15. Ricciaceæ, or Crystalworts, p. 57      |
| Spore-cases valveless or bursting irregularly, without operculum, but with elaters                | 16. Marchantiaceæ, or Liverworts, p. 58    |
| Spore-cases opening by a definite number of equal valves, without operculum, but with elaters     | 17. Jungermanniaceæ, or Scalemosses, p. 59 |
| Spore-cases peltate, splitting on one side, without operculum, and with an elater to every spore. | 18. Equisetaceæ, or Horsetails, p. 61      |

## 2. MUSCI.

- |   |                                      |
|---|--------------------------------------|
| Spore-cases opening by valves, with an operculum, without elaters | 19. Andræaceæ, or Splitmosses, p. 63 |
| Spore-cases valveless, with an operculum, without elaters         | 20. Bryaceæ, or Urnmosses, p. 64     |

## ALLIANCE 5. LYCOPODALES, p. 68.

- |  |  |
|--|--|
| Spore-cases 1-3-celled, axillary; reproductive bodies similar                  | 21. Lycopodiaceæ, or Clubmosses, p. 69 |
| Spore-cases many-celled, radicle (or axillary); reproductive bodies dissimilar | 22. Marsileaceæ, or Pepperworts, p. 71 |

## ALLIANCE 6. FILICALES, p. 74.

- |   |   |
|---|---|
| Spore-cases ringless, distinct, 2-valved, formed on the margin of a contracted leaf | 23. Ophioglossaceæ, or Adders' Tongues, p. 77 |
| Spore-cases ringed, dorsal or marginal, distinct, splitting irregularly             | 24. Polypodiaceæ, or Ferns, p. 78             |
| Spore-cases ringless, dorsal, connate, splitting irregularly by a ventral cleft     | 25. Danæaceæ, or Danæads, p. 82               |

## Class III. RHIZOGENS.

## ALLIANCE THE SAME AS THE CLASS, p. 83.

- |  |   |
|--|---|
| Ovules solitary, pendulous; fruit one-seeded.  | 26. Balanophoraceæ, or Cynomoriums, p. 89 |
| Ovules 00, parietal; fruit many-seeded; calyx 3-4-6 parted; anthers opening by slits | 27. Cytinaceæ, or Cistusrapes, p. 91      |
| Ovules 00, parietal; fruit many-seeded, calyx 5-parted, anthers opening by pores     | 28. Rafflesiaceæ, or Rafflesiads, p. 93.  |

## Class IV. ENDOGENS.

## ALLIANCES OF ENDOGENS.

- \* Flowers glumaceous; (that is to say, composed of bracts not collected in true whorls, but consisting of imbricated colourless or herbaceous scales).

## 7. GLUMALES.

- \*\* Flowers petaloid, or furnished with a true calyx or corolla, or with both, or absolutely naked; ♂ ♀ (that is having sexes altogether in different flowers, without half-formed rudiments of the absent sexes being present).

8. ARALES.—Flowers naked or consisting of scales, 2 or 3 together, or numerous, and then sessile on a simple naked spadix; embryo axile; albumen mealy or fleshy. (Some have no albumen.)

9. PALMALES.—Flowers perfect (with both calyx and corolla), sessile on a branched scaly spadix; embryo vague, solid; albumen horny or fleshy. Some Palms are ♂.

10. HYDRALES.—Flowers perfect or imperfect, usually scattered; embryo axile, without albumen. — aquatic. (Some are ♂.)

- \*.\*—Flowers furnished with a true calyx and corolla, adherent to the ovary; ♂.

11. NARCISSALES.—Flowers symmetrical; stamens 3 or 6, or more, all perfect; seeds with albumen; Some Bromeliaceæ have a free calyx and corolla.

12. ANOMALES.—Flowers unsymmetrical; stamens 1 to 5, some at least of which are petaloid; seeds with albumen.

13. ORCHIDALES.—Flowers unsymmetrical; stamens 1 to 3; seeds without albumen.



\* \* \* Flowers furnished with a true ovary and ovules, true free stamens,  $\frac{1}{2}$ .

14. *XYRIDALES*.—Flowers half triandrous, 2-3 polyandrous; albumen copious.

15. *JUNCACEAE*.—Flowers triandrous, the two triandrous divided 2' otherwise albumen copious; albumen fleshy or cartilaginous.

16. *ELIAGACEAE*.—Flowers triandrous, somewhat triandrous; albumen copious.

17. *AMYLACEAE*.—Flowers triandrous, triandrous; albumen less. Some different etc. etc. (see p. 17).

#### NATURAL ORDER OF PLANTS.

##### ALLIANCE 7. *GRAMINEAE*, p. 106.

Ovary 1-celled, with 2 or more distinct (or united) styles; ovule ascending; embryo lateral, naked.

Ovary 1-celled, with 2 or more distinct (or united) styles; ovule erect, embryo lateral.

Ovary several, sometimes united, with 1 style to each; ovules pendulous; embryo only styles 1-2; anthers 1-ranked, embryo terminal.

Ovary 1-2-celled, with 2 or 3 styles (rarely); ovules pendulous; embryo only; styles 1-3; anthers 1-ranked, embryo terminal.

Ovary 2-celled, with 1 style to each cell; ovules pendulous or horizontal; embryo only within the cavity; anthers 2-ranked; embryo terminal.

29. *Gramineae*, or *Grasses*, p. 106.

30. *Cyperaceae*, or *Sedges*, p. 117.

31. *Distichaceae*, or *Distichaceae*, p. 120.

32. *Isotriaeneae*, or *Isotriaeneae*, p. 121.

33. *Eleocharitaceae*, or *Eleocharitaceae*, p. 122.

##### ALLIANCE 8. *ARACEAE*, p. 123.

Flowers 2 or 3, of which one only is ♀. Spikes 0. Ovary 1-celled. Ovules about embryo slit.

Flowers 00, on a naked spathe. Ovary only or hairy. Anthers with long filaments.

Ovary solitary, pendulous. Seed attached to the pericarp. Embryo slit.

Flowers 00, naked, on a solitary spathe covered by a single hooded spathe. Anthers none. Seed loose. Embryo slit, hairy.

Flowers 00, naked or hairy, on a spathe covered by many spathe. Anthers absent. Seed loose. Embryo solid, minute.

34. *Araceae*, or *Araceae*, or *Araceae*, p. 123.

35. *Typhaceae*, or *Typhaceae*, or *Typhaceae*, p. 124.

36. *Araceae*, or *Araceae*, p. 127.

37. *Podostemaceae*, or *Podostemaceae*, p. 130.

##### ALLIANCE 9. *PALEACEAE*, p. 131.

38. *Polemoniaceae*, or *Polemoniaceae*, p. 131.

##### ALLIANCE 10. *HYDRACEAE*, p. 140.

Stamens epiphyllous; ovary 1-celled.

Stam. hyp.; ov. free; pollen adnate.

Stam. hyp.; A. 00, free; embryo, pale; pollen glandular.

Stam. hyp.; ov. free; pollen undifferentiated.

39. *Hypnaceae*, or *Hypnaceae*, p. 140.

40. *Najas*, or *Najas*, p. 143.

41. *Utriculariaceae*, or *Utriculariaceae*, p. 144.

42. *Utriculariaceae*, or *Utriculariaceae*, p. 145.

##### ALLIANCE 11. *NUCULACEAE*, p. 146.

Flowers triandrous, 4-merous, tubular.

Albumen mealy.

Flowers half triandrous, tubular. Albumen fleshy.

Flowers hexapetalous, tubular, somewhat imbricated. Stamens 6, opposite the petals, or 6; anthers turned towards. Rosters remote from the tube, when it is naked.

Flowers hexapetalous, much imbricated. Stamens 6; anthers turned towards. Rosters remote from the tube, when it is striated.

Flowers hexapetalous, much imbricated. Stamens 6, or more; anthers turned towards. Rosters next the tube.

Flowers hexapetalous. Stamens 6, opposite the sepals; anthers turned outwards.

43. *Nuculaceae*, or *Nuculaceae*, p. 147.

44. *Utriculariaceae*, or *Utriculariaceae*, p. 148.

45. *Hemipetalaceae*, or *Hemipetalaceae*, p. 149.

46. *Hypnaceae*, or *Hypnaceae*, p. 150.

47. *Hemipetalaceae*, or *Hemipetalaceae*, p. 151.

48. *Utriculariaceae*, or *Utriculariaceae*, p. 152.

##### ALLIANCE 12. *AMOMACEAE*, p. 152.

Stamens more than 1; anthers 2-celled, no vitellus.

Stamen but 1; anther 2-celled; embryo free vitellus.

Stamen but 1; anther 1-celled; embryo free vitellus.

49. *Utriculariaceae*, or *Utriculariaceae*, p. 153.

50. *Hemipetalaceae*, or *Hemipetalaceae*, p. 154.

51. *Utriculariaceae*, or *Utriculariaceae*, p. 155.

##### ALLIANCE 13. *ORCHIDACEAE*, p. 170.

Flowers regular. Stamens free, perianthous.

Flowers irregular, gynandrous. Placenta pericarpal.

Flowers regular, half gynandrous. Placenta axile.

52. *Utriculariaceae*, or *Utriculariaceae*, p. 171.

53. *Utriculariaceae*, or *Utriculariaceae*, p. 172.

54. *Utriculariaceae*, or *Utriculariaceae*, p. 173.



## ALLIANCE 14. XYRIDALES, p. 185.

- Sepals 0. Petals 2. Stamens 3, of which 2 are abortive. Embryo axile, in fleshy albumen. } 54. *Philytracæ*, or *Waterworts*, p. 186
- Sepals 3. Petals 3. Stamens 3, fertile. Carpels opposite sepals. Placentæ parietal. Embryo minute, on the outside of fleshy albumen. . . . . } 55. *Xyridacæ*, or *Xyrids*, p. 187
- Sepals 3. Petals 3. Stamens 6 (or 3). Carpels opposite sepals. Placentæ axile. Embryo trochlear, half immersed in fleshy albumen. . . . . } 56. *Commelynacæ*, or *Spiderworts*, p. 188
- Sepals 3. Petals 3. Stamens 3; (anthers 1 celled). Carpels opposite petals. Placentæ parietal. Embryo minute, on the outside of fleshy albumen. . . . . } 57. *Mayacæ*, or *Mayacs*, p. 189

## ALLIANCE 15. JUNCALES, p. 190.

- Flowers scattered. Embryo minute, undivided. } 58. *Juncacæ*, or *Rushes*, p. 191
- Flowers spadicaceous. Embryo axile, with a conspicuous cleft on one side. . . . . } 59. *Orontiacæ*, or *Orontids*, p. 193

## ALLIANCE 16. LILIALES, p. 195.

- Perianth surrounded by a calycine involucre, the inner bracts of which are coloured and petaloid. . . . . } 60. *Gilliesiacæ*, or *Gilliesiads*, p. 196
- Perianth naked, flat when withering. Anthers turned outwards; styles distinct; albumen fleshy. . . . . } 61. *Melanthacæ*, or *Melanths*, p. 198
- Perianth naked, flat when withering. Anthers turned inwards. Styles consolidated. Albumen fleshy. . . . . } 62. *Liliacæ*, or *Lilyworts*, p. 200
- Perianth naked, circinate when withering. Anthers turned inwards. Albumen mealy. . . . . } 63. *Pontederacæ*, or *Pontederads*, p. 206

## ALLIANCE 17. ALISMALES, p. 207.

- Flowers 3-petaloidous. Placentæ many-seeded, netted and parietal. . . . . } 64. *Butomacæ*, or *Butomads*, p. 208
- Flowers 3-petaloidous. Placentæ few-seeded, simple, and axile, or basal. Embryo solid. . . . . } 65. *Alismacæ*, or *Alismads*, p. 209
- Flowers scaly. Placentæ few-seeded, simple and axile, or basal. Embryo slit on one side, with a very large plumule. . . . . } 66. *Juncaginacæ*, or *Arrow-grasses*, p. 210

## Class V. DICTYOGENS.

## ALLIANCE THE SAME AS THE CLASS, p. 211.

(For Triuridacæ, formerly referred here, see p. 144 a.)

- Flowers ♂ ♀. Perianth adherent. Carpels consolidated, several-seeded. . . . . } 68. *Dioscoreacæ*, or *Yams*, p. 214
- Flowers ♂ ♀. Carpels several, quite consolidated. Placentæ axile. Flowers hexapetaloidous. . . . . } 69. *Smilacæ*, or *Sarsaparillas*, p. 215
- Flowers ♂. Carpels several, quite consolidated. Placentæ parietal. Flowers 3-6-petaloidous. . . . . } 70. *Philesiacæ*, or *Philesiads*, p. 217
- Flowers ♂. Carpels several, half-consolidated. Placentæ axile. Flowers 3-petaloidous. . . . . } 71. *Trilliaceæ*, or *Parids*, p. 218
- Flowers ♂. Carpels solitary, simple, many-seeded, with long stalked anatropal seeds and a basal placenta. . . . . } 72. *Roxburghiacæ*, or *Roxburghworts*, p. 219

## Class VI. GYMNOGENS.

## ALLIANCE THE SAME AS THE CLASS, p. 221.

- Stem simple, continuous. Leaves parallel-veined, pinnate. Scales of the cone antheriferous. . . . . } 73. *Cycadeucæ*, or *Cycads*, p. 223
- Stem repeatedly branched, continuous. Leaves simple, acerose. Females in cones. . . . . } 74. *Pinacæ*, or *Conifers*, p. 226
- Stem repeatedly branched, continuous. Leaves simple, often fork-veined. Females solitary. Membrane next the nucleus inclosed. Anthers 2-celled, opening longitudinally. . . . . } 75. *Taxacæ*, or *Taxads*, p. 236



Stems frequently woody, jointed. Leaves simple, undivided. Monocotyledonous. The Anthers of some *Tripsac.* & *Veronica* include produced. Anthers 1. (Edith. Cloning 1840.)

## Class VII. EXOGENS. ALLIANCE OF EXOGENS.

### Sub-Class I. DICLINOUS EXOGENS.

Flowers  $\frac{\delta}{\sigma}$ , or  $\frac{\delta}{\sigma}$  ; stamens and pistils distinct by  $\frac{\delta}{\sigma}$ .

18. *AMYLIFERÆ*.—Flowers in umbels, subglobose or somewhat globose; corolla superior; calyx inferior; with five sepals.
19. *URICACEÆ*.—Flowers without, somewhat globose; corolla mostly superior; calyx large, lobed; in a small number of flowers.
20. *EMBORBACEÆ*.—Flowers without, somewhat globose; corolla somewhat superior; glumes only; calyx inferior; perianth inferior. Alliances: *Emborba* & *Emborba*.
21. *QUERCIFERÆ*.—Flowers in umbels, some globose & some superior; calyx superior, lobed, entire.
22. *GALICIFERÆ*.—Flowers in umbels, some globose, some superior; corolla superior; glumes only; calyx inferior.
23. *MENISPERMACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
24. *CISTACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
25. *PAGETACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.

### Sub-Class II. HYPOGYNOUS EXOGENS.

Flowers  $\frac{\delta}{\sigma}$ , or  $\frac{\delta}{\sigma}$  ; stamens entirely free from the calyx and corolla.

26. *VERBACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
27. *CISTACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
28. *MAIACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
29. *SARISACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
30. *GLYCYRRHACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
31. *NYMPHACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
32. *RANACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
33. *BOERHACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
34. *LEGUMINEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
35. *RUBACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
36. *GLYCYRRHACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
37. *SIDACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
38. *CHENOPODIACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
39. *VERBACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.

### Sub-Class III. PERIGYNOUS EXOGENS.

Flowers  $\frac{\delta}{\sigma}$ , or  $\frac{\delta}{\sigma}$  ; stamens growing to the rim of either the calyx or the corolla, rarely squaring or lobes to.

40. *VERBACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
41. *DACYLIACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
42. *ROSACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.
43. *SANFRAZACEÆ*.—Flowers in umbels, some globose, some superior; corolla inferior; glumes only; calyx inferior.



44. RHAMNALES.—Flowers monochlamydeous; carpels consolidated; placenta axile; fruit capsular, berried, or drupaceous; seeds definite; embryo amygdaloid, with little or no albumen.
45. GENTIANALES.—Flowers dichlamydeous, monopetalous; placenta axile or parietal; embryo minute, or with the cotyledons much smaller than the radicle, lying in a large quantity of albumen.
46. SOLANALES.—Flowers dichlamydeous, monopetalous, symmetrical; placenta axile; fruit 2-3-celled; embryo large, lying in a small quantity of albumen. (Occasionally aelhamydeous or polyptalous).
47. CORTUSALES.—Flowers dichlamydeous, monopetalous, symmetrical; placenta free, central; embryo lying among a large quantity of albumen. (Occasionally monochlamydeous, or polyptalous).
48. ECHIALES.—Flowers dichlamydeous, monopetalous, symmetrical, or unsymmetrical; fruit nucameneaceous, consisting of several one-seeded nuts, or of clusters of them separate or separable; embryo large, with little or no albumen. (Very rarely hypogynous!)
49. BIGNONIALES.—Flowers dichlamydeous, monopetalous, unsymmetrical; fruit capsular or berried, with its pericarp quite consolidated; placenta axile, or parietal, or free central; embryo with little or no albumen.

## SUB-CLASS IV. EPIGYNOUS EXOGENS.

Flowers ♂ or ♀ or ♂ + ♀: stamens growing to the side of either the calyx or corolla; ovary inferior or nearly so.

50. CAMPANALES.—Flowers dichlamydeous, monopetalous; embryo with little or no albumen.
51. MYRTALES.—Flowers dichlamydeous, polyptalous; placenta axile; embryo with little or no albumen. (Occasionally monochlamydeous).
52. CACTALES.—Flowers dichlamydeous, polyptalous; placenta parietal; embryo with little or no albumen.
53. GROSSALES.—Flowers dichlamydeous, polyptalous; seeds numerous, minute; embryo small, lying in a large quantity of albumen.
54. CINCHONALES.—Flowers dichlamydeous, monopetalous; embryo minute, lying in a large quantity of albumen.
55. UMBELLALES.—Flowers dichlamydeous, polyptalous; seeds solitary, large; embryo small, lying in a large quantity of albumen.
56. ASARALES.—Flowers monochlamydeous; embryo small, lying in a large quantity of albumen.

## NATURAL ORDERS OF EXOGENS.

## ALLIANCE 18. AMENTALES, p. 248.

- |  |   |
|--|---|
| Ovary 1-celled. Ovule 1 or 2, ascending. Radicle superior. | 77. <i>Cusuarinaceæ</i> , or <i>Beefwoods</i> , p. 249  |
| Ovary 2-celled. Ovule 1, pendulous. Radicle superior.      | 78. <i>Betulaceæ</i> , or <i>Birchwoods</i> , p. 251    |
| Ovary 2-celled. Ovules 00. Seeds winged.                   | 79. <i>Altingiaceæ</i> , or <i>Liquidambar</i> , p. 253 |
| Ovary 1-celled. Ovules 00. Seeds cottony.                  | 80. <i>Salicaceæ</i> , or <i>Willowwoods</i> , p. 254   |
| Ovary 1-celled. Ovule 1, erect. Radicle superior.          | 81. <i>Myricaceæ</i> , or <i>Galeworts</i> , p. 256     |
| Ovary 1-celled. Ovule 1, ascending. Radicle inferior.      | 82. <i>Elæagnaceæ</i> , or <i>Oleasters</i> , p. 257    |

## ALLIANCE 19. URTICALES, p. 258.

- |  |   |
|--|---|
| Radicle superior. Ovules twin, suspended. Embryo straight, albuminous. Anthers 2 lobed, with vertical fissures.              | 83. <i>Stilaginaceæ</i> , or <i>Antidesmads</i> , p. 259  |
| Radicle superior. Ovule solitary, erect. Embryo straight, albuminous. Juice limpid. Stipules small, flat.                    | 84. <i>Urticaceæ</i> , or <i>Nettlewoods</i> , p. 260     |
| Radicle inferior. Embryo exalbuminous. Plumule many-leaved, large.   | 85. <i>Ceratophyllaceæ</i> , or <i>Hornwoods</i> , p. 263 |
| Radicle superior. Ovule solitary, suspended. Embryo hooked, exalbuminous.  | 86. <i>Cannabaceæ</i> , or <i>Hempwoods</i> , p. 265      |
| Radicle superior. Ovules solitary, suspended. Embryo hooked, albuminous.   | 87. <i>Moraceæ</i> , or <i>Morads</i> , p. 266            |
| Radicle superior. Ovule solitary, erect or suspended. Embryo straight, exalbuminous. Juice milky. Stipules large, convolute. | 88. <i>Artocarpaceæ</i> , or <i>Artocarpads</i> , p. 269  |
| Radicle inferior. Embryo albuminous. Plumule minute. Juice limpid. Stipules large, deciduous.                                | 89. <i>Platanaceæ</i> , or <i>Planes</i> , p. 272         |

## ALLIANCE 20. EUPHORBIALES, p. 273.

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|---|--|
| Ovules definite, suspended, anatropal. Radicle superior.                    | 90. <i>Euphorbiaceæ</i> , or <i>Spurgewoods</i> , p. 274 |
| Ovules definite, suspended, campylotropal. Radicle inferior, albumen mealy. | * <i>Gyrostemoneæ</i> , p. 282                           |
| Ovules definite, suspended, anatropal. Radicle superior. ♂ amentaceous.     | 91. <i>Scæpiceæ</i> , or <i>Scæpads</i> , p. 283         |
| Ovules definite, suspended, amphitropal. Radicle superior.                  | 92. <i>Callitricheæ</i> , or <i>Starwoods</i> , p. 284   |
| Ovules definite, ascending, anatropal. Radicle inferior.                    | 93. <i>Empetraceæ</i> , or <i>Crowberries</i> , p. 285   |
| Ovules solitary, ascending. ♀ naked, combined into a succulent cone.        | * <i>Batideæ</i> , p. 286                                |
| Ovules 00, ascending. Radicle inferior. Seeds scabiform.                    | 94. ? <i>Nepenthaceæ</i> , or <i>Nepenths</i> , p. 287   |







ALLIANCE 27. CISTALES, p. 348.

- |  |   |
|--|---|
| Stamens not tetradynamous, generally indefinite. Flowers $\sqrt{}$ or $\sqrt[3]{}$ . Seeds with albumen. Fruit closed up . . . . . | 122. <i>Cistaceæ</i> , or <i>Rock Roses</i> , p. 349    |
| Stamens tetradynamous. Flowers $\sqrt[4]{}$ . . . . .  | 123. <i>Brassicaceæ</i> , or <i>Crucifers</i> , p. 351  |
| Stamens not tetradynamous, definite. Flowers not tetramerous. Seeds without albumen. Fruit usually open at the point . . . . .     | 124. <i>Rosaceæ</i> , or <i>Weldworts</i> , p. 356      |
| Stamens not tetradynamous. Flowers $\sqrt[4]{}$ . Seeds without albumen. Fruit closed up . . . . .                                 | 125. <i>Capparidaceæ</i> , or <i>Capparids</i> , p. 357 |

ALLIANCE 28. MALVALES, p. 359.

- |  |   |
|--|---|
| Stamens columnar, all perfect. Anthers 2-celled, turned outwards . . . . .                           | 126. <i>Sterculiaceæ</i> , or <i>Sterculiads</i> , p. 360   |
| Stamens monadelphous, in most cases partly sterile. Anthers 2-celled, turned inwards . . . . .       | 127. <i>Bythneriaceæ</i> , or <i>Bythneriads</i> , p. 363   |
| Stamens free. Disk none. Seeds with albumen. Embryo curved. Petals permanent. Calyx ribbed . . . . . | 128. <i>Vivianiaceæ</i> , or <i>Vivianads</i> , p. 365      |
| Stamens free. Disk none. Seeds without albumen. Embryo amygdaloid . . . . .                          | 129. <i>Tropæolaceæ</i> , or <i>Indian Cresses</i> , p. 366 |
| Stamens columnar, all perfect. Anthers 1-celled, turned inwards . . . . .                            | 130. <i>Malvaceæ</i> , or <i>Mallowworts</i> , p. 368       |
| Stamens free, on the outside a disk. Seeds with albumen. Embryo straight . . . . .                   | 131. <i>Tiliaceæ</i> , or <i>Lindenblooms</i> , p. 371      |

ALLIANCE 29. SAPINDALES, p. 373.

- |   |   |
|---|---|
| Flowers complete, partially symmetrical. Calyx valvate. Anthers 2-4-celled, opening by pores . . . . .  | 132. <i>Tremandrææ</i> , or <i>Foreworts</i> , p. 374       |
| Flowers complete (irregular), unsymmetrical. Petals naked. Anthers 1-celled, opening by pores. Seeds cartuculate . . . . .  | 133. <i>Polygalaceæ</i> , or <i>Milkworts</i> , p. 375      |
| Flowers complete, unsymmetrical, very irregular. Petals naked. Anthers opening longitudinally. Carpels 3. Seeds winged. (In one case the ovary is adherent) . . . . . | 134. <i>Vochyaceæ</i> , or <i>Vochyads</i> , p. 379         |
| Flowers complete, partially symmetrical. Calyx imbricated. Ovaries ascending. Stigmas simple. Leaves opposite, with stipules . . . . .                                | 135. <i>Staphyleaceæ</i> , or <i>Bladder Nuts</i> , p. 381  |
| Flowers complete, unsymmetrical. Petals usually with an appendage or 0. Anthers opening longitudinally. Carpels 3. Seeds usually arillate, wingless . . . . .         | 136. <i>Sapindaceæ</i> , or <i>Soapworts</i> , p. 382       |
| Flowers apetalous. Carpel solitary . . . . .  | 137. <i>Petiveriaceæ</i> , or <i>Petiveriads</i> , p. 386   |
| Flowers complete, unsymmetrical. Petals naked or 0. Anthers opening longitudinally. Carpels 2. Seeds without an aril . . . . .  | 138. <i>Aceraceæ</i> , or <i>Maples</i> , p. 387            |
| Flowers complete, partially symmetrical. Calyx imbricated. Petals naked, stalked. Ovaries hanging by cords. Stigmas simple. Embryo usually convolute . . . . .        | 139. <i>Malpighiaceæ</i> , or <i>Malpighiads</i> , p. 388   |
| Flowers complete, partially symmetrical. Calyx imbricated. Petals with an appendage. Ovaries sessile, pendulous. Stigmas capitate. Embryo straight . . . . .          | 140. <i>Erythroxylaceæ</i> , or <i>Erythroxyls</i> , p. 391 |

ALLIANCE 30. GUTTIFERALES, p. 392.

- |  |   |
|--|---|
| Leaves simple, alternate, with large convolute stipules. Flowers symmetrical. Petals equilateral. Calyx unequal, permanent, winged. Anthers beaked. Fruit one-celled, one seeded . . . . . | 141. <i>Dipteraceæ</i> , or <i>Dipterads</i> , p. 393       |
| Leaves simple, alternate, without stipules or with very small ones. Flowers symmetrical. Petals equilateral. Anthers versatile. Seeds few or single. Stigmas on a long style . . . . .     | 142. <i>Ternstroemiaceæ</i> , or <i>Theads</i> , p. 396     |
| Leaves digitate, opposite. Flowers symmetrical. Petals equilateral. Stigmas sessile. Seeds solitary. Embryo with an enormous radicle . . . . .   | 143. <i>Rhizobolaceæ</i> , or <i>Rhizobols</i> , p. 398     |
| Leaves simple, opposite, without stipules. Flowers symmetrical. Petals equilateral. Anthers adnate, beakless. Seeds solitary or few. Stigmas sessile, radiating . . . . .                  | 144. <i>Clusiaceæ</i> , or <i>Guttifers</i> , p. 400        |
| Leaves simple, alternate, without stipules. Flowers unsymmetrical. Petals equilateral. Anthers versatile. Seeds innumerable, minute. Stigmas sessile . . . . .                             | 145. <i>Marcgraviaceæ</i> , or <i>Marcgraviads</i> , p. 403 |
| Petals oblique, glandular. Seeds numerous, small. Styles long, distinct . . . . .  | 146. <i>Hypericaceæ</i> , or <i>Tutsans</i> , p. 405        |
| Petals oblique, glandless. Seeds few, shaggy. Styles long, distinct . . . . .  | 147. <i>Reaumuriaceæ</i> , or <i>Reaumuriads</i> , p. 407   |



## ALLIANCE 31. NOMBUPALES, p. 400.

Carpels united into a many-celled fruit, with  
 dissipated placentae.  
 Carpels distinct. Albumen opaque. Teste  
 absent.  
 Carpels distinct. Albumen O. Teste distinct  
 confluent, very large.

143. *Agave*, or *Agave*, p. 400.144. *Agave*, or *Agave*, p. 400.145. *Agave*, or *Agave*, p. 400.

## ALLIANCE 32. RANALES, p. 416.

Carpels distinct. Stipules large, cordate.  
 Corolla dissipated. Albumen dissipated.  
 Carpels distinct. Stipules O. Corolla distinct.  
 Albumen confluent.  
 Carpels distinct. Stipules O. Corolla inter-  
 calate. Albumen homogeneous. Seeds ad-  
 herent.  
 Carpels distinct. Stipules O. Corolla inter-  
 calate. Albumen homogeneous. Seeds ad-  
 herent.  
 Carpels consolidated. Calyx perianthial. Plac-  
 entae axile.  
 Carpels consolidated. Calyx dissipated. Plac-  
 entae usually parietal.

146. *Agave*, or *Agave*, p. 400.147. *Agave*, or *Agave*, p. 400.148. *Agave*, or *Agave*, p. 400.149. *Agave*, or *Agave*, p. 400.150. *Agave*, or *Agave*, p. 400.151. *Agave*, or *Agave*, p. 400.152. *Agave*, or *Agave*, p. 400.

## ALLIANCE 33. BRUCALES, p. 432.

Flowers regular and symmetrical. Placenta  
 parietal. Stamens alternate with the petals  
 of true affinity.  
 Flowers irregular and unsymmetrical. Plac-  
 entae parietal. Stamens opposite the petals.  
 Flowers regular, symmetrical. Placenta axil-  
 lar. Stamens opposite the petals. Anthers  
 with recurved valves.  
 Flowers regular, symmetrical. Placenta axil-  
 lar. Stamens opposite the petals. Anthers  
 with recurved valves.  
 Flowers regular, symmetrical. Placenta axil-  
 lar. Stamens alternate with the petals.  
 Ovary ascending or horizontal.  
 Corolla imbricated.  
 Flowers regular, symmetrical. Placenta axil-  
 lar. Stamens alternate with the petals.  
 Ovary pendulous. Corolla valvate.  
 Flowers regular, symmetrical. Placenta axil-  
 lar. Stamens alternate with the petals.  
 Ovary pendulous. Corolla valvate.  
 Flowers regular, symmetrical. Placenta axil-  
 lar. Stamens alternate with the petals.  
 Ovary pendulous. Corolla valvate.

153. *Agave*, or *Agave*, p. 400.154. *Agave*, or *Agave*, p. 400.155. *Agave*, or *Agave*, p. 400.156. *Agave*, or *Agave*, p. 400.157. *Agave*, or *Agave*, p. 400.158. *Agave*, or *Agave*, p. 400.159. *Agave*, or *Agave*, p. 400.160. *Agave*, or *Agave*, p. 400.161. *Agave*, or *Agave*, p. 400.162. *Agave*, or *Agave*, p. 400.

## ALLIANCE 34. EUCALIS, p. 446.

Flowers polypetalous. Stamens all perfect  
 monadelphous. Anthers 2-celled, with a  
 long monadelphous connective.  
 Flowers monopetalous. Stamens all perfect  
 free. Seeds with a firm skin. Anthers  
 1-celled, opening longitudinally.  
 Flowers half mon. petalous. Stamens all per-  
 fect, free. Seeds with a loose skin. Anthers  
 at the base of the filament.  
 Flowers polypetalous. Stamens half steryl  
 and male fert. free. Seeds with a firm skin.  
 Flowers half mon. petalous. Stamens all per-  
 fect, free. Seeds with a loose skin. Anthers  
 at the base of the filament.  
 Flowers monopetalous. Stamens all perfect  
 free. Seeds with a firm or loose skin. An-  
 thers 2-celled, opening by pores.

163. *Agave*, or *Agave*, p. 400.164. *Agave*, or *Agave*, p. 400.165. *Agave*, or *Agave*, p. 400.166. *Agave*, or *Agave*, p. 400.167. *Agave*, or *Agave*, p. 400.168. *Agave*, or *Agave*, p. 400.169. *Agave*, or *Agave*, p. 400.170. *Agave*, or *Agave*, p. 400.

## ALLIANCE 35. RUCALES, p. 460.

Fruit consolidated, succulent, indehiscent.  
 Petals imbricated. Stamens free, or fused  
 in. Leaves dotted.  
 Fruit consolidated, hard, dry, succulent and  
 valvate. Petals valvate. Stamens free, fused  
 generally dotted.  
 Fruit consolidated, capsular. Stamens deca-  
 monadelphous or free. Seeds numerous  
 winged.  
 Fruit consolidated, berried, or capsular. Sta-  
 mens deeply monadelphous. Seeds few.  
 Angiosperm. Leaves dotted.  
 Fruit apocarpous. Ovary single, surrounded  
 by a cor. rising from the base of the ovary.

171. *Agave*, or *Agave*, p. 400.172. *Agave*, or *Agave*, p. 400.173. *Agave*, or *Agave*, p. 400.174. *Agave*, or *Agave*, p. 400.175. *Agave*, or *Agave*, p. 400.176. *Agave*, or *Agave*, p. 400.177. *Agave*, or *Agave*, p. 400.



- Fruit apocarpous. Ovules collateral, ascending, orthotropical, sessile . . . . . } 175. *Connuraceæ*, or *Connarads*, p. 468
- Fruit finally apocarpous, few-seeded, with the pericarp separating in two layers. Ovules sessile, pendulous. Flowers ♂ . . . . . } 176. *Rutaceæ*, or *Ruecorts*, p. 469
- Fruit finally apocarpous, few-seeded, with the pericarp separating in two layers. Ovules sessile, pendulous. Flowers ♂ - ♀ . . . . . } 177. *Xanthoxylaceæ*, or *Xanthoxyls*, p. 472
- Fruit finally apocarpous, one-seeded, with the pericarp not laminating, and a succulent conical torus . . . . . } 178. *Ochnaceæ*, or *Ochnads*, p. 474
- Fruit finally apocarpous, one-seeded, with the pericarp not laminating, and a dry inconspicuous torus. Albumen wanting. Leaves alternate, without stipules . . . . . } 179. *Simarubaceæ*, or *Quassiads*, p. 476
- Fruit finally apocarpous, few-seeded, with the pericarp not laminating, and a dry inconspicuous torus. Albumen present. Leaves opposite, with stipules . . . . . } 180. *Zygophyllaceæ*, or *Beancapers*, p. 478
- Fruit finally apocarpous, many-seeded. Flowers polypetalous . . . . . } 181. *Elatinaceæ*, or *Water-peppers*, p. 480
- Fruit finally apocarpous, many-seeded. Flowers apetalous, very imperfect . . . . . } 182. *Podostemaceæ*, or *Podostemads*, p. 482

ALLIANCE 36. GERANIALES, p. 484.

- Flowers symmetrical. Styles distinct. Carpels longer than the torus. Seeds with little or no albumen . . . . . } 183. *Linaceæ*, or *Flaxworts*, p. 485
- Flowers regular, unsymmetrical, with a permanent cup-like involucre. Stamens monadelphous. Albumen abundant . . . . . } 184. *Chlœnaceæ*, or *Chlenads*, p. 486
- Flowers symmetrical. Styles distinct. Carpels longer than the torus. Seeds with abundant albumen . . . . . } 185. *Oxalidaceæ*, or *Oxalids*, p. 488
- Flowers very irregular and unsymmetrical, without an involucre. Stamens distinct. Albumen none . . . . . } 186. *Balsaminaceæ*, or *Balsams*, p. 490
- Flowers usually symmetrical. Styles and carpels combined round a long beaked torus . . } 187. *Geraniaceæ*, or *Cranesbills*, p. 493

ALLIANCE 37. SILENALES, p. 495.

- Calyx and corolla usually both present and symmetrical (4 and 4, or 5 and 5), the latter conspicuous. Ovules amphitropical. Leaves opposite, without stipules . . . . . } 188. *Caryophyllaceæ*, or *Silenads*, p. 496
- Calyx and corolla usually both present and symmetrical (4 and 4, or 5 and 5), the latter rudimentary. Ovules amphitropical. Leaves with scarious stipules . . . . . } 189. *Illecebraceæ*, or *Knotworts*, p. 499
- Calyx and corolla both present and unsymmetrical (2 and 5), the latter usually conspicuous. Ovules amphitropical. Leaves alternate, succulent, without stipules . . . } 190. *Portulacææ*, or *Purslanes*, p. 500
- Calyx only present, but often coloured. Ovules orthotropical. Nut usually triangular . . . } 191. *Polygonaceæ*, or *Buckwheats*, p. 502

ALLIANCE 38. CHENOPODALES, p. 505.

- Sepals united into a long (often coloured) plaited tube, which separates from its base, the latter becoming hard, and forming a spurious pericarp . . . . . } 192. *Nyctaginaceæ*, or *Nyctagos*, p. 506
- Sepals separate, flat. Stamens alternate with the sepals or 00. Carpels several (or 1) . . } 193. *Phytolaccaceæ*, or *Phytolaccads*, p. 509
- Sepals separate or nearly so, flat. Stamens opposite the sepals. Anthers often 1-celled. Ovary 1, often several-seeded. (Flowers scarious, surrounded by imbricated bracts) . } 194. *Amarantaceæ*, or *Amaranths*, p. 510
- Sepals separate, or nearly so, flat. Stamens opposite the sepals. Anthers 2-celled. Ovary 1, always one-seeded. (Flowers herbaceous, naked) . . . . . } 195. *Chenopodiaceæ*, or *Chenopods*, p. 512

ALLIANCE 39. PIPERALES, p. 514.

- Carpel solitary. Ovule erect. Embryo lying in vitellus. Leaves opposite or alternate, with or without stipules . . . . . } 196. *Piperaceæ*, or *Pepperworts*, p. 515
- Carpel solitary. Ovule suspended. Embryo naked. Leaves opposite, with intermediate stipules . . . . . } 197. *Chloranthaceæ*, or *Chloranths*, p. 519
- Carpels several, distinct. Ovule erect. Embryo lying in vitellus. Leaves alternate, with stipules . . . . . } 198. *Saururaceæ*, or *Saururads*, p. 521







- Flowers monopetalous. Stamens epipetalous. Ovules, in part at least, suspended. Radicle long. Cotyledons leafy . . . 228. *Styracaceæ*, or *Storaxworts*, p. 592

**ALLIANCE 45. GENTIANALES, p. 594.**

- Stipules 0. Stigmas simple, sessile, radiating . . . 229. *Ebenaceæ*, or *Ebenads*, p. 595  
 Stipules 0. Stigmas simple, at the end of a manifest style. Placentæ axile. Seeds definite, pendulous. Corolla imbricated . . . 230. *AQUIFOLIACEÆ*, or *Hollyworts*, p. 597  
 Stipules 0. Stigmas collected into a massive head, expanded at the base in the form of a ring or membrane, and contracted in the middle. Albumen sometimes (?) . . . 231. *Apocynaceæ*, or *Dogbanes*, p. 599  
 Leaves opposite, with intervening stipules . . . 232. *Loganiaceæ*, or *Loganiads*, p. 602  
 Stipules 0. Stigmas simple, at the end of a manifest style. Placentæ axile. Seeds indefinite, peltate. Stamens interpetalous . . . 233. *Diapensiaceæ*, or *Diapensiads*, p. 606  
 Stipules 0. Stigmas simple, at the end of a manifest style. Placentæ axile. Seeds definite, erect. Corolla valvate. Flowers unsymmetrical . . . 234. *Stilbaceæ*, or *Stilbids*, p. 607  
 Stipules 0. Stigmas simple, at the end of a manifest style. Placentæ parietal. Flowers didynamous . . . 235. *Orobanchaceæ*, or *Broomrapes*, p. 609  
 Stipules 0. Stigmas simple, at the end of a manifest style. Placentæ parietal. Flowers regular . . . 236. *Gentianaceæ*, or *Gentianworts*, p. 612

**ALLIANCE 46. SOLANALES, p. 615.**

- Stamens free, 2 or 4 . . . 237. *Oleaceæ*, or *Oliveworts*, p. 616  
 Stamens free, 5. Placentæ axile. Embryo terete . . . 238. *Solanaceæ*, or *Nightshades*, p. 618  
 Anthers and stigma consolidated into a column . . . 239. *Asclepiadaceæ*, or *Asclepiads*, p. 623  
 Stamens free, 5. Placentæ axile. Cotyledons leafy, folded longitudinally . . . 240. *Coriaceæ*, or *Scbestens*, p. 628  
 Stamens free, 5. Placentæ basal. Cotyledons leafy, doubled up . . . 241. *Convolvulaceæ*, or *Bindweeds*, p. 630  
 Stamens free, 5. Placentæ basal. Embryo filiform, spiral . . . 242. *Cuscutaceæ*, or *Dodders*, p. 633  
 Stamens free, 5. Placentæ axile. Cotyledons straight, plano-convex . . . 243. *Polemoniaceæ*, or *Phloxworts*, p. 635

**ALLIANCE 47. CORTUSALES, p. 637.**

- Stamens alternate with the petals. Styles 2. Inflorescence circinate . . . 244. *Hydrophyllaceæ*, or *Hydrophyls*, p. 638  
 Stamens opposite the petals. Fruit membranous, one-seeded. Styles 5. Stem herbaceous . . . 245. *Plumbaginaceæ*, or *Leadworts*, p. 640  
 Stamens alternate with the petals. Style 1. Inflorescence straight . . . 246. *Plantaginaceæ*, or *Ribworts*, p. 642  
 Stamens opposite the petals. Fruit capsular, many-seeded. Style 1. Stem herbaceous . . . 247. *Primulaceæ*, or *Primworts*, p. 644  
 Stamens opposite the petals. Fruit indehiscent, drupaceous. Style 1. Stem woody . . . 248. *Myrsinaceæ*, or *Ardisiads*, p. 647

**ALLIANCE 48. ECHIALES, p. 649.**

**\*Regular-flowered Orders, passing from Solanales.**

- Flowers regular.  $\sqrt{3}$ . unsymmetrical. Stamens 2. Fruit 2-lobed. Stigma naked . . . 249. *Jasminaceæ*, or *Jasminworts*, p. 650  
 Flowers regular, symmetrical. Stamens 4. Fruit simple. Stigma naked . . . 250. *Salvadoraceæ*, or *Salvadorads*, p. 652  
 Flowers regular, symmetrical. Stamens 5. Stigma naked. Nuts 4, confluent. Inflorescence circinate . . . 251. *Ehretiaceæ*, or *Ehretiads*, p. 653  
 Flowers regular, symmetrical. Stamens 5. Nuts 5 or  $\sqrt{5}$ . Stigma naked. Inflorescence straight . . . 252. *Nolanaceæ*, or *Nolanads*, p. 654  
 Flowers regular, symmetrical. Stamens 5. Nuts 4 or  $\sqrt{4}$ . Stigma naked. Inflorescence circinate . . . 253. *Boraginaceæ*, or *Borageworts*, p. 655  
 Flowers regular, symmetrical. Nut solitary. Stigma indusiate. (stamens hypogynous?) . . . 254. *Burmanniaceæ*, or *Burmanniads*, p. 657

**\*\* Irregular-flowered Orders, passing into Bignonials.**

- Flowers irregular, unsymmetrical. Nuts 4. Ovule erect . . . 255. *Lamiaceæ*, or *Labiates*, p. 659  
 Flowers irregular, unsymmetrical. Nuts confluent. Ovules erect . . . 256. *Verbenaceæ*, or *Verbenes*, p. 663  
 Flowers irregular, unsymmetrical. Nuts confluent. Ovules pendulous. Anthers 2 celled . . . 257. *Myoporaceæ*, or *Myoporads*, p. 665



Flowers irregular, unisexual. Nuts  
coherent. Ovary pendulous. Anthers 1-  
celled.

208. *Salpiglossis*, or *Salpiglossis*, p. 100

AGASSIZ 49. BIGNONIACEÆ, p. 668.

Placenta parietal. Fruit bony or irregular.  
Embryo anguloid. Radicle short.

209. *Passiflora*, or *Passiflora*, p. 100

Placenta parietal. Fruit capsular or bony.  
Embryo with minute cotyledons. Radicle  
long.

210. *Crucianthus*, or *Crucianthus*, p. 101

Placenta parietal. Fruit succulent. Fruit  
shelled. Embryo anguloid. Radicle short.

211. *Crucianthus*, or *Crucianthus*, p. 101

Placenta axile. Seeds winged, sessile, without  
albumen. Cotyledons large, fleshy.

212. *Bignoniaceæ*, or *Bignoniaceæ*, p. 101

Placenta axile. Seeds sessile, attached to  
hard placental process, without albumen.  
Cotyledons large, fleshy.

213. *Aspidosperma*, or *Aspidosperma*, p. 101

Placenta axile. Seeds albuminous. Cotyle-  
dons scarcely larger than, or not so large as,  
the radicle.

214. *Scaphospermum*, or *Scaphospermum*, p. 101

Placenta free, central. Seeds minute, without  
albumen. Cotyledons much smaller than  
the radicle.

215. *Leptodermis*, or *Leptodermis*, p. 101

AGASSIZ 50. CARIACACEÆ, p. 668.

Ovary 2- or more-celled. Anthers free, or  
half united. Stigma naked. Corolla valvate,  
tubular.

216. *Caryocarpus*, or *Caryocarpus*, p. 101

Ovary 2- or more-celled. Anthers synanther-  
ous. Stigma surrounded by hairs. Corolla  
valvate, irregular.

217. *Lobelia*, or *Lobelia*, p. 101

Ovary 2- or more-celled. Anthers synantherous,  
or free. Stigma indusiate. Corolla tubu-  
lar.

218. *Gracilicarpus*, or *Gracilicarpus*, p. 101

Ovary 2- or more-celled. Stamens and style  
united into a column. Corolla imbricated.

219. *Staphylea*, or *Staphylea*, p. 101

Ovary 1-celled. Corolla imbricated. Anthers  
free. Ovule pendulous. Albumen none.

220. *Passiflora*, or *Passiflora*, p. 101

Ovary 1-celled. Corolla imbricated. Anthers  
free. Ovule pendulous. Seeds albuminous.

221. *Triplaris*, or *Triplaris*, p. 101

Ovary 1-celled. Corolla valvate. Anthers syn-  
genous. Ovule pendulous. Seeds albumi-  
nous.

222. *Caryocarpus*, or *Caryocarpus*, p. 101

Ovary 1-celled. Corolla valvate. Anthers syn-  
genous. Ovule erect. Albumen none.

223. *Aspidosperma*, or *Aspidosperma*, p. 101

AGASSIZ 51. MYRTACEÆ, p. 716.

Ovary 1-celled. Ovules pendulous. Leaves  
dotted. Seeds without albumen. Cotyle-  
dons connate.

224. *Conostemon*, or *Conostemon*, p. 717

Ovary 1-celled. Ovules pendulous. Leaves  
dotted. Seeds albuminous. Cotyledons flat.

225. *Alphitonia*, or *Alphitonia*, p. 717

Ovary 1-celled. Ovules ascending. Leaves  
dotted. Embryo fused into a solid mass.

226. *Chamodromus*, or *Chamodromus*, p. 717

Ovary with more than one cell. Flowers poly-  
petalous or apetalous. Calyx open, imbricate.  
Stamens definite. Ovules pendulous. Cotyle-  
dons minute. Occasionally one-celled.

227. *Heterostemon*, or *Heterostemon*, p. 717

Ovary with more than one cell. Flowers poly-  
petalous or apetalous. Calyx valvate. Stamens  
definite. Ovules horizontal or ascending.  
Cotyledons flat, much larger than the  
radicle.

228. *Conostemon*, or *Conostemon*, p. 717

Ovary with more than one cell. Flowers poly-  
petalous. Calyx valvate. Stamens indefinite.  
Cotyledons flat, much shorter than the radi-  
cle, which terminates before the fruit falls.

229. *Alphitonia*, or *Alphitonia*, p. 717

Ovary with more than one cell. Flowers mono-  
petalous or apetalous. Calyx valvate. Stamens  
indefinite, monadelphous. Cotyledons  
anguloid.

230. *Passiflora*, or *Passiflora*, p. 717

Ovary with more than one cell. Flowers poly-  
petalous. Calyx imbricated. Stamens defi-  
nite. Anthers retracted. Leaves usually  
dotted.

231. *Myrtaceæ*, or *Myrtaceæ*, p. 717

Ovary with more than one cell. Flowers poly-  
petalous or apetalous (or valvate). Calyx  
imbricated. Stamens 00. Anthers oblong.  
Leaves usually dotted.

232. *Myrtaceæ*, or *Myrtaceæ*, p. 717

Ovary with more than one cell. Flowers poly-  
petalous. Calyx valvate or imbricated. Stamens  
00, in part collected into a callosity  
hood. Anthers oblong. Leaves dotted.

233. *Conostemon*, or *Conostemon*, p. 717



ALLIANCE 52. CACTALES, p. 741.

- |   |   |   |
|---|---|---|
| Sepals and petals distinct. Stamens opposite the petals. Styles separate. Ovules pendulous . . . . .                                  | } | 284. <i>Homaliaceæ</i> , or <i>Homaliads</i> , p. 742 |
| Sepals and petals distinct. Stamens scattered. Styles confluent. Ovules pendulous. Seeds albuminous . . . . .                         |   | 285. <i>Loasaceæ</i> , or <i>Loasads</i> , p. 744     |
| Sepals and petals numerous, undistinguishable. Stamens scattered. Styles confluent. Ovules horizontal. Seeds without albumen. . . . . | } | 286. <i>Cactaceæ</i> , or <i>Indian Figs</i> , p. 746 |

ALLIANCE 53. GROSSALES, p. 749.

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|---|---|---|
| Fruit pulpy. Placenta parietal . . . . .  | } | 287. <i>Grossulariaceæ</i> , or <i>Currantworts</i> , p. 750    |
| Fruit capsular. Placenta axile. Style and stamens definite. Calyx imbricated . . . . .  |   | 288. <i>Escalloniaceæ</i> , or <i>Escalloniads</i> , p. 752     |
| Fruit capsular. Placenta axile. Styles distinct. Stamens 00. Calyx valvate . . . . .    | } | 289. <i>Philadelphaceæ</i> , or <i>Syringas</i> , p. 743        |
| Fruit pulpy or fibrous. Placenta axile. Style 1. Stamens 00. Calyx imbricated . . . . . |   | 290. <i>Barringtoniaceæ</i> , or <i>Barringtoniads</i> , p. 754 |

ALLIANCE 54. CINCHONALES, p. 756.

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|---|---|---|
| Stamens epigynous; anthers opening by pores. . . . .  | } | 291. <i>Vacciniaceæ</i> , or <i>Cranberries</i> , p. 757    |
| Stamens epipetalous, bursting longitudinally; anthers sinuous. Flowers unsymmetrical . . . . .                                  |   | 292. <i>Columelliaceæ</i> , or <i>Columelliads</i> , p. 759 |
| Stamens epipetalous, bursting longitudinally; anthers straight. Leaves with interpetiolar stipules . . . . .                    | } | 293. <i>Cinchonaceæ</i> , or <i>Cinchonads</i> , p. 761     |
| Stamens epipetalous, bursting longitudinally; anthers straight. Fruit consolidated. Leaves without stipules . . . . .           |   | 294. <i>Caprifoliaceæ</i> , or <i>Caprifolds</i> , p. 766   |
| Stamens epipetalous, bursting longitudinally; anthers straight. Fruit didymous. Leaves verticillate, without stipules . . . . . | } | 295. <i>Galiaceæ</i> , or <i>Stellates</i> , p. 768         |

ALLIANCE 55. UMBELLALES, p. 772.

- |  |   |   |
|--|---|---|
| Fruit didymous, with a double epigynous disk. . . . .  | } | 296. <i>Apiaceæ</i> , or <i>Umbellifers</i> , p. 773        |
| Fruit not didymous, without a double epigynous disk, 3- or more-celled. Pentamerous flowers. Corolla valvate. Leaves alternate, without stipules. Anthers turned inwards, opening lengthwise . . . . . |   | 297. <i>Araliaceæ</i> , or <i>Ivyworts</i> , p. 780         |
| Fruit not didymous, without a double epigynous disk, 2- or more celled. Tetramerous flowers. Corolla valvate. Leaves opposite, without stipules . . . . .  | } | 298. <i>Cornaceæ</i> , or <i>Cornels</i> , p. 782           |
| Fruit not didymous, without a double epigynous disk, 2-celled. Corolla imbricated. Leaves alternate, with stipules. Anthers with deciduous valves . . . . .  |   | 299. <i>Hamamelidaceæ</i> , or <i>Witch-Hazels</i> , p. 784 |
| Fruit not didymous, without a double epigynous disk, 8- (or 1-) celled. Corolla imbricated. Leaves alternate, without stipules. Anthers turned outwards, opening lengthwise . . . . .                  | } | 300. <i>Bruniaceæ</i> , or <i>Bruniads</i> , p. 785         |

ALLIANCE 56. ASARALES, p. 786.

- |  |   |   |
|--|---|---|
| Ovary 1-celled. Ovules definite, with a coated nucleus . . . . . | } | 301. <i>Santalaceæ</i> , or <i>Sandalworts</i> , p. 787     |
| Ovary 1-celled. Ovules definite, with a naked nucleus . . . . .  |   | 302. <i>Loranthaceæ</i> , or <i>Loranths</i> , p. 789       |
| Ovary 3-6-celled. Ovules 00 . . . . .                            | } | 303. <i>Aristolochiaceæ</i> , or <i>Birthworts</i> , p. 792 |



## VEGETABLE KINGDOM.

WHEN the Animal Kingdom is studied as a vast whole, and not merely in the highly-developed classes of Mammals, Birds, and Reptiles, the naturalist perceives forms with which he is most familiar gradually changing, organs which are indispensable to the highest orders of Animals disappearing, the limbs ceasing to be formed, all the internal structure of the body simplified, and, at last, nothing left but pulpy and seemingly shapeless masses, such as inhabit shells. Let his power of vision be enlarged, and the microscope discovers to his amazement, that the Animal Kingdom has not ceased with the soft-bodied creatures at which his inquiry had stopped, but that a new and vast field of observation opens before him, teeming with myriads of forms, which are, as it were, the beginning of another kingdom of nature. Nevertheless, he soon finds that the smallness of the size of these creatures is no hindrance to their possessing the peculiar attributes of animal life. Though bones, and muscles, and external limbs, with veins, arteries, and nerves, may have disappeared, or become too fine for human vision, yet there is still left the animal motion, and the power of hunting for prey, of feeding by a mouth and by the destruction of other species, which is one of the great marks of animal structure. He sees that cells, although so small that the acutest vision and the most powerful instruments are alone sufficient to detect them, are the recipients of a stomach, of eyes, of a mouth. He perceives in such bodies all those elements of activity, by which the Animal Kingdom is in general so well distinguished from the passive Region of plants.

And hence it is that those who deal in generals only, without descending to particulars, pronounce with a voice of authority that the Animal and Vegetable Kingdoms are sundered by decisive characteristics. The zoologist declares that the power of spontaneous motion, and the feeding by a stomach, are qualities confined to the Animal Kingdom. But numerous plants move with all the appearance of spontaneity; the spores of those *Cenocia* which are sometimes called Zoosporous, swim in water with great activity; the filaments of *Zygnemata* combine with the energy of animal life; and as for a stomach, it is impossible to say, that the whole interior of a living independent cell is not a stomach. Chemists once referred to the presence of nitrogen as a certain characteristic of animals; but plants abound in nitrogen. With more reason they now appeal to the existence of starch in plants, an organic compound unknown among the animal creation. And this is perhaps the



best mark of distinction that has hitherto been found ; for it is universally present in plants, and has enabled Mr. Payen to confirm by chemical evidence the vegetable nature of certain productions till lately regarded as Zoophytes, and therefore as belonging to the Animal Kingdom. (*Ann. Sc. Nat.* 2. ser. xx. 65.)

But it has been long ago asserted by Bory de St. Vincent, and others, that there exist in nature organised bodies which are animal at one period of their lives, and vegetable at another ! This, if true, would for ever put an end to the possibility of distinguishing the two kingdoms when they shall each have arrived at their lowest forms. Its truth has, however, been denied. On the contrary, Kützing, in his recent magnificent work on Algæ, insists that it happens in his *Ulothrix zonata*, (Fig. I.) He asserts that in the cells of that plant there are found minute animalcules, with a red eye-point, and a



Fig. I.

transparent mouth-place ; that they are not in fact, distinguishable from Ehrenberg's *Microglæna monadina* ; these bodies, however, are animals only for a time. At last they grow into vegetable threads, the lowest joint of which still exhibits the red eye-point. This phenomenon, which Kützing assures us he has ascertained beyond all possibility of doubt, puts an end to the question of, whether animals and plants can be distinguished at the limits of their two kingdoms, and sufficiently accounts for the conflicting opinions that naturalists entertain as to the nature of many of the simpler forms of organisation.

Such being the case, it is not worth attempting to decide, whether the lowest forms of structure, to be presently mentioned, belong to the one Kingdom or the other. It will be sufficient that they have been regarded as plants by many eminent naturalists.

It is in this microscopical cellular state of existence that the Animal Kingdom ends, and the Vegetable commences. It is from this point that the naturalist who would learn how to classify the Kingdom of Plants must take his departure. He perceives that those species which consist of cells, either independent of each other (*Protococcus*, *Uredo*), or united into simple threads (*Conferva*, *Monilia*), are succeeded by others in which the threads collect into nets (*Hydrodictyon*), or plates (*Ulva*), or the cells into masses (*Laminaria*, *Agaricus*) ; peculiar organs make their appearance, and at last, as the complication of structure increases, a leaf and stem unfold as distinctly limited organic parts.

Those simpler plants which exist without the distinction of leaf and stem, are also destitute of flowers ; they are equally without the breathing-pores so abundantly formed in the skin of more complex species, and they multiply by the spontaneous formation in their interior, or upon their surface, of reproductive spheroids called spores. Among the many names that Botanists have given such plants, that of *THALLOGENS* is here preferred. A thallus is a fusion of root, stem and leaves, into one general mass ; and that is much the nature of these elements of Vegetable structure.

Fig. I. *ULOTHRIX ZONATA*, after Kützing.—1. A portion of the plant discharging its vegeto-animalcules : 2. the latter much enlarged, and in various states of progress into a thread ; 3. a young thread, or plant, three or four days old, much less magnified.



Beyond Thallogens are found multitudes of species, which like the former, are not furnished by nature with flowers, but which otherwise approach closely to the higher forms of structure, occasionally acquiring the nature of lofty trees. They have broadamp-vees in their skin; their leaves and stem are distinctly separated; in some of them, those spiral threads which form so striking a portion of the internal anatomy of a more perfect species, exist in considerable abundance; and finally, they multiply by reproductive spheroids, or spores, either formed without the agency of sex, or, if the contrary shall be proved, at all events not possessing bodies constructed like stamens on the one hand and embryos on the other. Their stem, however, does not increase in diameter; it only grows at the end, and hence it has given to such plants the name of *Acrogens*.\*

The changes which thus occur in the races of Thallogens and Acrogens, represent the progress of development in the remainder of the Vegetable Kingdom. A sphere, called a pollen grain, protrudes a tube into a soft pulpy receptacle in the interior of an ovule; there the new plant takes its birth, at first in the form of a cell, which by degrees forms a thread (the suspensory), then generates a cellular mass (the young embryo), and eventually becomes a mass of cells arranged in the form of stem and leaves (the perfect embryo, with its cotyledons, radicle, and plumula). But this is not the end of growth; it is rather the beginning. A loftier destiny awaits such plants; flowers are to be formed, seeds to be fertilised, and this is to be effected by a complex apparatus unknown in Acrogens or Thallogens.

Foremost among the more perfect races comes a most anomalous collection of species, called RHIZOGENS, or Rhizanth. These plants, leafless and parasitical, have the loose cellular organisation of Fungi; a spiral structure is usually to be found among their tissue only in traces. Some of them spring visibly from a shapeless cellular mass which stands in place of stem and root, and seems to be altogether analogous to the thallus of Fungi; and it is probable, that they all partake in this singular mode of growth. Their flowers are like those of more perfect plants; their sexual apparatus is complete; but their embryo, which is not furnished with any visible radicle or cotyledons, appears to be a spherical or oblong homogeneous mass. Rhizogens seem, in fact, of an intermediate nature between Fungal Thallogens and Endogens.

The remainder of the Vegetable Kingdom consists of plants laying flowers, and propagated by seeds; that is to say, by bodies procreated by the mutual action of two manifest and undoubted sexes. Such plants are therefore called PHANOGAMOUS or SEXUAL.

Sexual plants are themselves divisible into two unequal masses. Of these masses one consists of species whose germination is epibothal, whose embryo has but one cotyledon, whose leaves have parallel veins, and whose trunk is formed of bundles of spiral and dotted vessels grouped by woody tubes; which bundles are arranged in a confused manner, and are repulsed in the centre of the trunk. These are *ESCOGENTS*.

The other mass is composed of innumerable races having an exobothal germination, an embryo with two or more cotyledons, leaves having a network of veins, and a trunk consisting of woody bundles composed of dotted and woody tubes, or of woody tubes alone, arranged around a central pith, and either in concentric rings, or in a homogeneous mass, but always having medullary plates, forming rays from the centre to the circumference, and

\* Thallogens and Acrogens together constitute the *Ascomycetes* of *DeCand.* the *Endogonaceae* of *ARTHUR* of *Richard* & the *AGASTES*, *CRYPTOGAMES*, or *Ascomycetes* of *SWENSON*, the *Stromas* of *FRANK*.



reproduced in the circumference of the trunk, whence their name of **EXOGENS**.

Among Exogens there are, however, two totally different modes in which the influence of the pollen is communicated to the seed. The larger part of this great class consists of plants provided with the apparatus called style and stigma, through which pollen-tubes are introduced into the ovary during the act of fertilisation. But others are so constructed that the pollen falls immediately upon the ovules, without the introduction of any intermediate apparatus; a peculiarity analogous to what occurs among reptiles in the Animal Kingdom: and, as was to have been anticipated, the plants in which this singular habit occurs prove, upon being collected together, to form a group having no direct affinity with those among which they had been previously associated. Hence Exogens have been broken up into 1. *Exogens* proper, or those having an ovary, style, and stigma; and 2. **GYMNOGENS**, which have neither.

Among Endogens no difference has been remarked in the mode of propagation, but a material peculiarity has been noticed in the manner of growth. In the great mass of the class the stem and root are formed in a similar way, or there is no considerable difference between them, and the leaves have no articulation with the stem; but in a part of them the root is exactly like that of an Exogen without concentric circles, and the leaves fall off the stem by a clean fracture, just as in that class. Such fundamental distinctions have given rise to the separation by me of Endogens into 1. *Endogens* proper, and 2. **DICTYOGENS**.

This gives us for the whole Vegetable Kingdom the following

## CLASSES.

### *Asexual, or Flowerless Plants.*

- |  |                       |
|--|-----------------------|
| Stems and leaves undistinguishable . . . . | <b>I. THALLOGENS.</b> |
| Stems and leaves distinguishable . . . .   | <b>II. ACROGENS.</b>  |

### *Sexual, or Flowering Plants.*

- |   |                        |
|---|------------------------|
| Fructification springing from a thallus . . . . | <b>III. RHIZOGENS.</b> |
| Fructification springing from a stem.           |                        |

Wood of stem arranged in a confused manner, youngest in the centre :  
cotyledon single.

- |  |                      |
|--|----------------------|
| Leaves parallel-veined, permanent; Root much<br>like the stem internally . . . . | <b>IV. ENDOGENS.</b> |
|--|----------------------|

- |  |                       |
|--|-----------------------|
| Leaves net-veined, deciduous; Root with the<br>wood in a solid concentric circle . . . . | <b>V. DICTYOGENS.</b> |
|--|-----------------------|

Wood of stem arranged in a concentric or uniform manner, youngest at  
the circumference; cotyledons 2 or more.

- |  |                       |
|--|-----------------------|
| Seeds quite naked . . . .              | <b>VI. GYMNOGENS.</b> |
| Seeds enclosed in seed-vessels . . . . | <b>VII. EXOGENS.</b>  |



## CLASS I. THALLOGENS.

*Agardh, Look in Bot. Mar. III. C. Lichens, Del. II. Pl. 1. 68. 1815. Agardh, Lichens, Del. II. 72. Homocystis, Fung. Syst. 1822. Agardh, Lich. exim. Cylindropuntia, Lich. Mar. 1822. Thallophtya, Lich. Gen. 1. Amphiscena, Del. Lich. Exim. 1822. p. 31. 1822.*

The whole of the plants stationed in this class are remarkable for the extreme simplicity of their structure. They have no wood, properly so called, although in the case of some sea-weeds and Fungi they must acquire considerable age. Those spirally-coated tubes which the old anatomists called tracheæ, because of their respiratory office, are unknown among them, unless occasionally in the form of local cells connected with the reproductive organs only; and consequently upon the surface of even the most perfect of them there is no sign of the organic apertures in the skin called stomates or breathing-pores. They are mere masses of cells. On their surface nothing is discoverable which can be regarded as analogous to leaves: for even in such sea-weeds as *Hypnea*, which resemble mosses in appearance, and in some of the Lichens which seem leafy, the exact symmetry which, without exception, characterises true foliage is wanting. In *Chara* alone, which is wholly leafless, do we find a symmetrical arrangement even of the divisions of the axis. Their mode of reproduction is not by pollen and ovules, or by sexual apparatus, as it is usual to call those parts, of which there is no sign, but by a special disintegration and solidification of some part of their tissue, spontaneously effected in various ways according to their kinds. It is true that such names as *Antheridia* and *Pistillidia* are met with in the writings of Cryptogamic Botanists, from which it might be inferred that something analogous at least to sexes was observable among such plants: but these are theoretical expressions, and unconnected with any proof of the parts to which they are applied performing the office of anthers and pistils. If it should be assumed, as it has been by some, that they do represent sexual organs, it is to be remembered that it is a mere assumption unsupported by sufficient evidence. Even in *Chara*, in whose globule some writers have seen a true anther, so little reason is there to suppose that it deserves such a name, that, on the contrary, an observer, worthy of credit, assures us that he has seen it grow. Secondly, in the simplest forms of Thallogens, is all trace of sex's missing; that in some of them their reproductive matter has been regarded by certain writers as altogether of an ambiguous nature. In their opinion, it is even uncertain whether this matter will reproduce its like, and whether it is not a mere representation of the vital principle of vegetation, capable of being called into action either as a Fungus, an Alga, or a Lichen, according to the particular conditions of heat, light, moisture, and motion, in which it is placed; producing Fungi upon dead or putrid organic beings: Lichens upon living vegetables, earth, or stones: and Alga—where water is the medium in which it is developed. Kützting, *Ann. des Sc. nat. n. p.* 220), endeavours to maintain the following propositions connected with this subject: "1st, the formation of organic matter can only take place by means of the previously dissolved elements of other organic principles: 2nd, simple globules, such as *Cryptococcus*, *Palmella*, and *Protococcus*, can give birth to different formations according to the influence of light, air, and tempera-



ture ; 3rd, we must regard all the forms of lower Algæ as vegetations of a very simple structure, and distinguish them from each other, notwithstanding that in certain circumstances they may raise themselves to vegetations of a higher form ; for in other circumstances they can exist and multiply independently ; 4th, the same superior formation may be produced by primitive formations of altogether different kinds."

It is not easy to settle the limits of the alliances of Thallogens. Linnæus and Jussieu had but two divisions, viz., Algæ (including Lichens) and Fungi ; and they have been followed by some modern botanists, particularly Fries and Wahlenberg. Others have been satisfied with separating the Lichens from Algæ, which, indeed, was virtually done by most of those who acknowledged but two divisions ; and with admitting three equally distinct groups. Some, on the contrary, have sought to multiply the orders, as De Candolle and others, by introducing a tribe called Hypoxyla ; Greville by adopting the latter, Gastromyci, Byssoidæ, and Epiphytæ, and proposing a new group under the name of Chætophoroideæ ; and finally, Adolphe Brongniart, who carries the number of groups in this division of Acotyledones as far as 12, viz. Lichens, Hypoxyla, Fungi, Lycoperdaceæ, Mucedineæ, Uredineæ, Fucaceæ, Ulvaceæ, Ceramiaceæ, Confervæ, Chaodineæ, and Arthrodiæ ; part of which have originated with himself, and others with Bory de St. Vincent. It is clear, however, that these groups are of very unequal degrees of importance, and that after all they must be reduced under the three great forms whose existence is universally recognised.

In what way those forms can be best defined is a very difficult question. It has been said that Algæ are aquatics, while Lichens and Fungi are terrestrial ; but Fungi will develop in water, when they assume the form of Algæ. Lichens have been characterised by their shields, or reproductive disks containing spores lying in the fusiform spore-cases called asci ; but a whole division of Lichens consists of genera without such asci. Then as to Fungi, they have been characterised by the want of a thallus, which is essential to Lichens ; but the mycelium or spawn of Fungi is really a thallus ; and it is impossible to distinguish by that character the genus *Verrucaria* of Lichens from *Sphæria* of Fungi. According to two of the most skilful of our modern systematists, the following are the distinctions of the three great groups :—

AGARDH (1821).

1. ALGÆ. Aquatic plants, filamentous, lamelliform, or leafy, intensely and brightly coloured, including spores, which are either contained in pericarps or scattered over the surface.
2. FUNGI. Fugacious, pulverulent, flocculent, crustaceous or fleshy plants, arising out of the destruction of organic matter (or capable of doing so), whitish, or coloured, not green, with their spores immersed.
3. LICHENS. Perennial plants, crustaceous, laminated or filiform, not of a leaf-green, including spores plunged in a thallus as well as in shields.

ADOLPHE BRONGNIART (1843).

1. ALGÆ. Frond cellular, living in fresh or salt water (rarely in very moist air), fixed by suckers or little roots.
2. FUNGI. Thallus filamentous (or Mycelium), developed on land or in dead or living organisms, producing reproductive organs externally.
3. LICHENS. Frond of various forms, living in air, fixed by cellular fibrils, without a thallus developed in subjacent bodies. Fructification, occupying limited spaces on the surface of the frond, formed of thæcæ mixed with paraphyses.

Neither of these definitions is however satisfactory ; they hold indeed in many cases ; but many Fungi have not a filamentous thallus ; again some Lichens (especially if *Collema* be included) have a filamentous thallus, and some species are all but aquatic, *e. g.* *Verrucaria submersa*. In Algae again,



in the terrestrial *Vaucheria*, the terrestrial *Sphaerocysta*, &c., the fruit is developed in free air; so also in *Botrydium*, *Trentepohlia*, and *Agarotheca*.

Mr. Berkeley finds that "the main distinction between Fungi and Algae (including Lichens) consists in the fact that Fungi are universally nourished by the matrix by means of their mycelium, while Lichens and Algae are nourished at the expense of the medium in which they vegetate. In a few cortical species of Lichens, indeed, there is a very intimate connection between the bark and stroma, but then in these cases there are the green gonidia which do not exist in Fungi. It is true that moulds will vegetate in fluids; but as soon as they assume their normal form, there is a distinction between the immersed and free portion."

Following these views, I venture to propose the following as the characteristic marks of the

#### ALLIANCES OF THALLOGENS.

ALGALES.—*Cellular flowerless plants, nourished through their whole surface by the medium in which they vegetate; living in water or very damp places; propagated by zoospores, coloured spores, or tetraspores.*

FUNGAL.—*Cellular flowerless plants, nourished through their thallus (stroma or mycelium); living in air; propagated by spores coloured or brown, and sometimes inclosed in asci; destitute of green gonidia.*

LICHENALES.—*Cellular flowerless plants, nourished through their whole surface by the medium in which they vegetate; living in air; propagated by spores usually inclosed in asci, and always having green gonidia in their thallus.*



# ALLIANCE I. ALGALES.—THE ALGAL ALLIANCE.

Algae, *Juss. Gen.* 5. (1788); *DC. Fl. Fr.* 2. 2. (1815); *Agardh Synops. Alg.* (1817); *Species Alg.* (1821-1828); *Syst. Alg.* (1824); *Greville Alg. Brit.* (1830); *Hooker, Brit. Fl.* vol. 2. pt. 1. (1833); *Agardh Jti Algae Maris Mediterraneæ*; *Decaisne in Ann. Sc. Nat.* 2 ser. vols. 17 & 18, *passim*; *Kützling, Phycologia Generalis. Endlicher, Gen. Suppl.* 3.—Phycei, *Acharius* (1807 ?).—Thalassiphyta, *Lamouran Ann. Mus.* 20. (1812); *Gaillon in Dict. des Sc.* 53. 350. (1828).—Hydrophyta, *Lyngb. Tandem.* (1819).—Arthrodiæ, *Bory in Dict. Class.* 1. 591. (1822).—Hydroneuræ, *Nees in Nov. Act. Nat. Cur.* 11. 509. (1823); *Ann. des Sc.* 13. 439. (1828).—Chaodineæ, *Confervæ* and *Ceramium*, *Bory in Dict. Class.* 3. and 4. (1823).—Chaetophoroideæ, *Greville Fl. Edin.* 321. (1824).—Hydrophyceæ, *Fries Syst. Orb. Veg.* 320. (1825).—Nematozaires, *Gaillon in Ann. Sc. Ser.* 2. 1. 44. (1834); *Phycées, Mont. Dict. Univ. d'Hist. N. sub. Algis* (1843).

**DIAGNOSIS.**—Cellular flowerless plants, nourished through their whole surface by the medium in which they vegetate; living in water or very damp places; propagated by zoospores, coloured spores, or tetraspores.

It is here that the transition from animals to plants, whatever its true nature may be, occurs; for it is incontestable, as the varying statements of original observers testify, that no man can certainly say whether many of the organic bodies placed here belong to the one kingdom of nature or the other. Whatever errors of observation may have occurred, those very errors, to say nothing of the true ones, show the extreme difficulty, not to say impossibility, of pointing out the exact frontier of either kingdom. If those ambiguous marine productions, which Pallas considered to be plants, but which Lamarek and Decaisne have to be merely sea-vegetables coated with calcareous matter, we have in that fact another testimony to the near approach of the two realms being through the Algal alliance. Indeed, if any faith is to be placed in the observations of Kützling and Hornschuch, the one is capable of giving birth to the other. The former of these writers mentions (*Ann. Sc. Nat.* 2. ser. 5. 376) a very extraordinary fact, if it be one. He cut to pieces the marine animal called *Medusa aurita*, washed the pieces carefully in distilled water, put them into a bottle of distilled water, corked it close, and placed it in a window facing the east. The bits of *Medusa* soon decomposed, and emitted a very offensive odour, during which time no trace of Infusoria was discoverable. After a few days the putrid smell disappeared, and myriads of Monads came forth. Shortly after the surface of the liquid swarmed with extremely small green points, which eventually covered the whole surface; similar points attached themselves to the sides of the bottle; seen under a microscope they appeared to be formed of numberless Monads, united by a slimy mass; and at last, after some weeks, the *Conferva fugacissima* of Lyngbye developed itself in perfection.

Reissek, of Vienna, goes still further. He professes to have observed the green colouring matter of ordinary flowering plants metamorphosed into *confervæ*; such forms were even witnessed by him proceeding from the pollen cells of plants (*Bot. Zeit.* 1844. July 19). Kützling also believes that the lower forms of Algae are capable of being changed into more highly organised species, or even into species belonging to different families of the higher cellular plants. With regard to these astounding statements I cannot do better than avail myself of the excellent remarks of the Rev. M. J. Berkeley, than whom no one has a more intimate knowledge of the subject in question. In Taylor's *Annals of Natural History*, vol. xiv. p. 434, he observes, "that such observations cannot be considered conclusive, apart from all prejudice either way, till a certain number of bodies ascertained to be precisely of the same nature be isolated, and the changes of these observed with every possible precaution to avoid error. At present it seems that there is not by any means sufficient proof that the objects in question really arise from germs of the same nature. The second remark we would make is, that there appears too often in treatises of this description to be great indistinctness as to the notion of what a species really is. We know that in the course of development higher bodies go through a vast variety of phases which resemble very closely true substantial species which have arrived at their full development; but we are not therefore to suppose, that in passing through their phases the production has really consisted of such a number of real species. In the sense of Agardh this may be true enough; for when he pronounces the vessels and cells of phænogamous plants to be *Algæ*, his meaning appears to be, however strongly he expresses himself, merely that they are representatives of *Algæ*, and resemble them in structure.

"We would remark, also, that the real difficulty of the case does not depend on the question as to the difference of animal and vegetable life. These evidently in certain parts of the creation are so intimately combined, that it is quite impossible to say where the one ceases and the other begins; and there is really no reason why we should be



incredulous as to the possibility of the same object being at one time endowed more especially with animal, and at another with vegetable life. Late investigations of the reproductive bodies of some Algae show that their union is produced by conjugation, exactly in the same way as in certain animals. But it is exceedingly difficult to imagine the transformation of one real species into another. The same species may assume a vast variety of forms according to varying circumstances, and it is highly instructive to observe these changes; but that the same species should under different circumstances be capable of producing beings of an almost entirely different nature, each capable of reproducing its species, is a matter which ought not to be admitted generally without the strictest proof."

For what wise purpose the Creator has filled the sea and the rivers with countless myriads of such plants, so that the Flora of the deep waters is as extensive as that of dry land, we can only conjecture; the uses to which they are applied by man are, doubtless, of but secondary consideration; and yet they are of no little importance in the manufactures and domestic economy of the human race. One of the most singular facts connected with them is their property of growing occasionally upon living animals, which they destroy; this is the case with *Achlya proflera*, to be hereafter noticed.

Their history and classification have occupied the attention of some of the most acute botanists of the present day. Bishop Agardh and his son, Greville, Harvey, Decaisne, and Kützing, deserve to be especially named as most excellent and skillful investigators of a very obscure and difficult subject. It is those only who have made the subject their peculiar study who can determine which of the classifications proposed by these authors has the strongest claim on attention. I, at least, am unable to decide; and therefore I have preferred to employ the arrangement made use of by Eudorin in his last Supplement, as that which is most likely to be permanently employed, or some years to come. Those who wish to acquaint themselves with the views of the great Algologists of the day should consult the younger Agardh's *Algae Maris Mediterraneae*, &c. (1842); Greville's *Algae Britannicae* (1850); Harvey's *Manual of British Algae* (1841); Decaisne's papers in the *Annales des Sciences Naturelles*, 2<sup>e</sup> Série, vol. xvii. (1842); Kützing's *Phylogie generale, oder Anatomie, Physiologie und Systemkunde der Tange* (1843), a most elaborate work, illustrated with eighty explanatory plates; the *Kunstschulgen Handbuch oder Dictionary*, &c. by the same author, with three plates, 1844, which we regret to say we know only by name; the younger Agardh's *Adversaria in Systemata Algaeum Eudorinæ*, 1844, and various papers of Dr. Montagne.

## NATURAL ORDERS OF ALGAE.

Crystalline, angular, fragmentary bodies, beak-like, and multiplying by spontaneous septation	1	DIATOMACEÆ.
Vesicular, filamentary or membranous bodies, multiplied by implosion generated in the interior at the expense of their own matter	2	CONFERTACEÆ.
Cellular or tubular asymmetrical bodies, multiplied by simple spores formed externally	3	PHYCITÆ.
Cellular or tubular asymmetrical bodies, multiplied by detumescence	4	CHLORELLACEÆ.
Tubular spontaneously branched bodies, multiplied by apical conical nodules, filled with starch	5	CHARACEÆ.

\* \* \* For the information of those who may wish to know something of the system of Kützing, which I do not adopt, the following list is extracted from his *great work*, to which the reader is referred for an explanation of the peculiar views of the author.

## - 1. CLASS. ISOCARPETE.

[illegible]



IX. LEPTOTRICHÆÆ. — Leptothrix, Asterothrix, Symphyothrix, Symploca, Dietyothrix, Entothrix, Inactis.

b.) Mesospermeæ.

X. LIMNOCHLORÆÆ. — Limnochloë.

XI. NOSTOCÆÆ. — Nostoc, Hormosiphon, Anabana, Spherozyca, Cylindrospermum, Spermisira, Nodularia.

XII. SCYTONEMÆÆ. — Drilosiphon, Scytoneima, Synchata, Symphiosiphon, Siroisiphon.

c.) Parasporangia.

XIII. LANGEYÆÆ. — Siphoderma, Amphithrix, Leioderma, Lyngbya, Heterothrix.

XIV. CALOTHRIXÆÆ. — Calothrix, Calothrix, Calothrix, Schizothrix, Schizodictyon, Dictyonema.

d.) Hypospermeæ.

XV. MASTICOTRICHÆÆ. — Merizomyria, Masticotrix, Mastichenema, Schizosiphon, Geocyclus.

XVI. RIVULARIÆÆ. — Physactis, Heteractis, Chalaractis, Atractis, Limnactis, Rivularia, Dasyactis, Eumetis.

B. DERMATOSPERMEÆ.

a.) Endospermeæ.

XVII. HORMIDIÆÆ. — Hormidium, Goniotrichum, Algonium, Gloetila, Schizogonium, Schizomeres, Borelia.

XVIII. ULOTRICHÆÆ. — Ulothrix, Stygoecolium.

XIX. CONFERVÆÆ. — Dolozonium, Psichohormium, Conferva, Sponzopsis, Rhizoclonium, Sphaeroplea, Cladophora, Crenacantha, Azaropila, Sponcomorpha, Periplegmatica, Palnia, Fischeria.

XX. ZYGNEMÆÆ. — Monogonia, Sirogonium, Staurispermum, Spirogyra, Zygnema, Zygonium.

XXI. HYDRODICTYÆÆ. — Hydrodictyon

b.) Ectospermeæ.

XXII. PROTONEMÆÆ. — Goniatopsis, Protonema.

XXIII. CHLANTHANÆÆ. — Chroolepus, Chlanthania, Chlorotylum.

XXIV. DRAPARNALDIÆÆ. — Draparnaldia.

XXV. ECTOCARPÆÆ. — Ectocarpus.

XXVI. SPHACELARIÆÆ. — Sphacelaria, Halopteris, Stygoecolium, Bellia, Chaetopteris, Cladostephus.

Subordo IV. — Dermatoblasteæ.

XXVII. ULVÆÆ. — Phylactidium, Protoderma, Prasiola, Ulva.

XXVIII. PHYCOSERIDÆÆ. — Phycoseris, Diplostemonium, Phycolophum.

XXIX. ENTEROMORPHÆÆ. — Enteromorpha, Chlorosiphon, Stictosiphon, Dictyosiphon.

Subordo V. — Cariblasteæ.

XXX. VAUCHERIÆÆ. — Botrydium, Vaucheria, Bryopsis, Valonia.

XXXI. CAULERPEÆÆ. — Caulerpa.

XXXII. CODIÆÆ. — Codium, Rhizozonium, Halimeda, Corallocephalus, Rhizoccephalus.

XXXIII. ANADYOMENÆÆ. — Anadyomene.

XXXIV. POLYPHYSEÆÆ. — Acetabularia, Polyphysa.

XXXV. DASYCLADEÆÆ. — Cymopolia, Dasycladus, Ascotammon.

XXXVI. CHARÆÆÆ. — Nitella, Charopsis, Chara.

ORDO II. — CRYPTOSPERMEÆÆ.

XXXVII. LEMNÆÆÆ. — Thermocellum, Lemnalia, Halysium.

XXXVIII. CHÆTOPHOREÆÆ. — Chætophora, Chætoderma, Thorea.

XXXIX. BATRACHOSPERMEÆÆ. — Batrachospermum.

XL. LIAGORÆÆÆ. — Liagora.

XLI. MESOGLEACEÆÆ. — Cladosiphon, Myriactis, Phycephala, Corynophlæa, Corynephora, Mesoglea, Chordaria.

ORDO III. — PYCNOSPERMEÆÆ.

XLII. CHORDEÆÆ. — Chorda, Spermatocnus, Halorhiza.

XLIII. ENCELÆÆÆ. — Encelium, Halodictyon, Striaria.

XLIV. DICTYOTÆÆÆ. — Dichophyllum, Cutleria, Stechospermum, Spatoglossum, Haloglossum, Halyseris, Stypopodium, Phycopteris, Zonaria, Phyllitis.

XLV. SPOROCHNEÆÆ. — Sporocnus, Carpomitra, Desmarestia, Arthrocladia.

XLVI. LAMINARIÆÆÆ. — Phleorhiza, Laminaria, Hafgygia, Phycocastanum, Alaria, Costeria, Agarum, Thalassiphyllum, Lessonia, Macrocytis, Nereocystis.

Tribus II. — Angiospermeæ.

XLVII. FUCEÆÆ. — Splachnidium, Durvillæa, Hormosira, Ecklonia, Himanthalia, Fucus, Carpaglossum, Physocaulon, Scytothalia, Phyllospora, Sirococcus.

XLVIII. CYSTOSIRÆÆÆ. — Treptacantha, Halericia, Phyllacantha, Cystosira, Hormophysa, Halidrys, Pycnophycus.

XLIX. SARGASSEÆÆ. — Pterocaulon, Sargassum, Turbinaria, Carpophyllum, Phycobotrys.

L. HALOCHLOÆÆÆ. — Blossivæa, Spongocarpus, Halochloa, Myagropsis, Carpacanthus, Sirophysalis, Coccophora, Scaberia, Carpodesmia.

II. CLASS. — HETEROCARPEÆÆ.

Tribus III. — Paracarpææ.

ORDO I. — TRICHOBLASTEÆÆ.

LI. CALLITHAMNIÆÆÆ. — Callithamnion, Griffithsia, Halurus, Phlebothamnion, Wrangelia, Spyridia, Ptilota.

LII. CERAMIEÆÆÆ. — Hornoceras, Gonetoceras, Echinoceras, Acanthoceras, Ceramium, Centroceras, Microcladia.

ORDO II. — EPIBLASTEÆÆ.

LIII. PORPHYRÆÆÆ. — Porphyra, Hiddenbrandtia, Pyssonelia.

LIV. SPONGIETÆÆÆ. — Halalidium, Pncophyllum, Melobesia, Spongia.

LV. CORALLINEÆÆÆ. — Amphiræa, Corallina, Jania.

ORDO III. — PERIBLASTEÆÆ.

LVII. GYMNOPLATEÆÆÆ. — Gymnophlæa, Helminthia, Naccaria.

LVII. CHETANGIÆÆÆ. — Chetangium, Thamnoecolium, Sarcophycus.

LVIII. HALAMENIÆÆÆ. — Myelodium, Halymenia, Dumontia, Halarachnion, Catenella.

LIX. CAULACANTHÆÆÆ. — Caulacanthus, Acanthobolus.

LX. GIGARTINIÆÆÆ. — Iridæa, Chondrodicton, Grateloupia, Mastocarpus, Chondros, Chondracanthus, Euhymenia, Constantinea, Calophyllis, Sarcophyllis, Solieria, Furcellaria, Gigartina.

LXI. RHYNCHOCOCCÆÆÆ. — Rhynchococcus, Callidapharis.

LXII. CYSTOCOLONIÆÆÆ. — Cystoclonium, Hypnophycus.

LXIII. GELIDIÆÆÆ. — Acrocarpus, Echinocaulon, Gelidium, Ctenodus.

LXIV. SPHEROCOCCÆÆÆ. — Bowiesia, Sphærococcus, Trematocarpus.

LXV. TYLOCARPEÆÆÆ. — Tylocarpus, Oncotylus, Pachycarpus, Phyllotylus, Coccotylus, Phyllophora, Acanthotylus.

Tribus IV. — Choristocarpeææ.

ORDO IV. — AXONOBlasteÆÆÆ.

LXVI. DASYÆÆÆ. — Dasya, Eupogonium, Trichothamnion







clouds or darkness the reverse. It usually takes place at the earliest hours of the morning; in *Vaucheria* about 8 A.M., in *Cutleria* at daybreak. *Enteromorpha clathrata* is the only kind that has been seen to emit them in the afternoon. A high temperature is unfavourable, moderate warmth promotes the phenomenon; this is shown by the rapidity with which Algae brought into a warm room emit their zoospores.

*Duration of the Motion.*—The movement of zoospores generally lasts only a few hours, and seldom continues beyond the day on which they are emitted; sometimes, however, as in *Ulothrix zonata*, several remain active even on the third day. Motion is suddenly arrested by alcohol, ammonia, acids, iodine, &c.; the latter colours them brown, which renders it more easy to perceive their cilia.

*Their Relation to Infusoria.*—M. Thuret wholly denies their identity with or mutability into animalcules. He points out their resemblance to the common *Diselmis viridis*, (or *Chlamydomonas pulvisculus*) which renders ponds green; and he believes that when the *Diselmis* has become attached to the edge of a vessel, and is motionless, assuming a spheroidal figure, that it has been confounded with germinating zoospores. He regards it as probable that observers have confounded all manner of microscopical globules, however different from each other in their nature; and that infusoria, zoospores, the spores of mosses, the green gonidia of lichens, &c., all regarded as the same thing, have given rise to the notion that one kind of Alga could not only produce a different species, but even a moss, a liverwort, or a lichen. The reader is requested to consult M. Thuret's important memoir in the *Annales des Sciences Naturelles*, sér. 3, vol. xiv., or his *Recherches sur les Zoospores des Algues et les Anthéridies des Cryptogames*, (Paris, 1851.) and the admirable plates which accompany the treatise.

This author proposes to divide algae into two primary groups, of which one is propagated by zoospores, and the other not. The zoosporous part he arranges thus:—

ZOOSPOREÆ *Decaisne* (exclusive of *Nostochineæ*, *Rivulariæ*, *Oscillatoriæ*, *Palmetellæ*, *Lemnææ*)—*Aplosporeæ* *Decaisne* (exclusive of *Batrachospermeæ*, *Fucacæ*, and some *Dictyotæ*).

### § 1. Chlorosporeæ. Colour, usually green.

*Bryopsidæ*; *Confervæ*; *Draparnaldiæ*; *Ulvacæ*; *Ædogoniæ*; *Vaucheriæ*; *Saprolegniæ*; *Derbesiæ*; *Spongodiæ*.

### § 2. Pheosporeæ. Colour, brown or olive.

*Ectocarpæ*; *Myrionemæ*; *Chordariæ*; *Sporochneæ*; *Punctariæ*; *Dictyosiphonæ*; *Scytosiphonæ*; *Laminariæ*; *Cutleriæ*.

That these zoospores are the means by which Algae are propagated seems to be proved by the following experiment made by Stackhouse, and recorded in his *Nereis Britannica*:

“Having procured a number of wide-mouthed jars, together with a siphon to draw off the water without shaking or disturbing it, on Sept. 7, 1796, I placed my plants (*F. serratus*, *canaliculatus*, and *tuberculatus*.) carefully in the jar, with their bases downwards, as in their natural state; on the following morning I decanted off the sea water, and, letting it subside in the basin, I found a few particles at the bottom, which, on being viewed with the microscope, appeared to be little fragments detached from the surface by friction in carriage. I then poured a fresh quantity of sea water on the plants, and placed them in a window facing south: on the following morning the jar containing the plants of *F. canaliculatus* discharged into the basin a few yellowish grains, which, on examining them, I found to be the actual seeds of the plant; they were rather oval than pear-shaped, but the most curious circumstance attending the observation was, that each individual seed was not in contact with the water, but enveloped with a bright mucilaginous substance. It was easy to guess the wise economy of nature in this disposition, which, as hinted above, serves a double purpose: each equally necessary towards continuing the species. On the following morning a greater quantity of seeds were discharged by this plant, and at this time a few seeds were procured from *F. serratus*; but this latter plant discharged such a quantity of mucous fluid that the sea water in which the plant was immersed was of the consistence of syrup, and consequently, the seeds being kept suspended, it was difficult to separate them. The seeds of *F. canaliculatus*, however, were numerous, and visible to the naked eye, and after letting the water rest for a few minutes it was no difficult matter, by gently inclining the basin, to pour off the water and let the seeds remain. In performing this operation I was witness to an explosion or bursting



of one of these seeds or pericarps, which floated the water conveniently under the microscope and brought to my recollection the circumstances mentioned by Agassiz Valley during his investigation of *F. vesiculosa*. I at last obtained a *Gelidium* of seeds likewise from *F. biturcata* (submedusa); these perfectly resembling the others. Having established this point, viz., that marine plants require that mode of their native element without violence when ripe, and without leaving the beach of the frond, I next procured some sea pebbles and small fragments of rocks taken from the beach, and having drained off the greater part of the water in the jar, I pressed the remainder on them, and left them dry the same time that the seeds might suffer themselves. I then fastened strings to the pebbles, and alternately sunk them in sea water in a wide-mouthed jar and left them exposed to the air, in order to imitate as nearly as possible their peculiar situation between high and low water mark; and when the weather was rainy I took care to expose them to it. In less than a week a thin membrane was discoverable on the surface of the pebble where the seeds had lodged, with a naked eye; this gradually extended itself, and turned to a rather olive colour. It continued increasing in size till at last there appeared numerous papillæ or buds coming up from the membrane; these buds when viewed with a glass, were rather hollow in the centre, from which a stout pushed forth; in some instances they seemed on a short, thick footstalk, and in this latter case resembled in some measure the peizæ-formed seedling of *F. loreus*, and the others without stems were like the stemless *Pozize*. These plants continued to put forth the coated shoots for some time but their growth was not rapid after the first efforts; most probably owing to their confined situation; and as I was six or eight miles from the sea and had not the opportunity of placing the pebbles in some of those pools which are left by the sea at low water, I discontinued the experiment.

# ADDITIONAL GENERA.

*Limnospira*, Kütz. in *Paludosa*.  
*Prothotheca*, Agass. in *Leptotheca*.

*Immeria*, Kütz. in *Rhythmus*.  
*Chlorostichum*, Agass. in *Leptotheca*.



## ORDER I. DIATOMACEÆ. BRITTLEWORKS.

Diatomaceæ, *Agardh, Syst. xii.* (1824); *Kützinger, in Linnaea*, 8. 529; *Part of Chaodineæ and Fragillariæ, Bory in Dict. Class. 3. and 4.* (1823); *Endlich. Gen. I.*; *Ralfs. in Ann. Nat. Hist. 11 et seq.*

DIAGNOSIS.—*Crystalline, angular, fragmentary bodies, brittle, and multiplying by spontaneous separation.*

Crystalline fragmentary bodies, generally bounded by right lines, rarely included in curved lines, flat, stiff, brittle, usually nestling in slime, uniting into various forms, and then separating again.

Those who have ever examined the surface of stones constantly moistened by water, the glass of hothouses, the face of rocks in the sea, or of walls where the sun never shines, or the hard paths in damp parts of gardens after rain, cannot fail to have remarked a green mucous slime with which such places are covered. This slime consists of Algals in their simplest state of organisation; they have been called Chaodineæ by Bory de St. Vincent, whose account of them is to the following effect: "The slime resembles a layer of albumen spread with a brush; it exfoliates in drying, and finally becomes visible by the manner in which it colours green or deep brown. One might call it a provisional creation waiting to be organised, and then assuming different forms, according to the nature of the corpuscles which penetrate it or develop among it. It may further be said to be the origin of two very distinct existences, the one certainly animal, the other purely vegetable. This matter lying among amorphous mucus consists, in its simplest state, of solitary, spherical corpuscles; these corpuscles are afterwards grouped, agglomerated, or chained together, so producing more complex states of organisation. Sometimes the mucus, which acts as the basis or matrix of the corpuscles, when it is found in water, which is the most favourable medium for its development, lengthens, thickens, and finally forms masses of some inches extent, which float and fix themselves to aquatic plants. These masses are at first like the spawn of fish, but they soon change colour, and become green, in consequence of the formation of interior vegetable corpuscles. Often, however, they assume a milky or ferruginous appearance;

and if in this state they are examined under a microscope, they will be found completely filled with the animalcules called Naviculariæ, Lunulinæ, and Stylariæ, assembled in such dense crowds as to be incapable of swimming. In this state the animalcules are inert.

Are they developed here, or have they found their way to such a nidus, and have they hindered the development of the green corpuscles? Is the mucus in which they lie the same to them as the albuminous substance in which the eggs of many aquatic animals are deposited? At present we have no means of answering these questions."

These form, no doubt, the extreme limits of the Vegetable and Animal Kingdom. Their regular form, and the power of separating into distinct particles, which the most of them have, are almost as much the attributes of the mineral, as of the vegetable, or even animal kingdom. Agardh includes them among plants. Kützinger asserts that their life is as much animal as vegetable; and that,

at all events, Achnanthes, Gomphonema, Exilaria, Fragillaria, Meloseira, Schizonema, Micromega, and Berkleya, are at least plants, if Frustulia, Cymbella, Navicula, Surirella, &c., are animalcules. He has also recently ascertained, that the frustules of Micromega are metamorphosed into green globular spores. Dr. Dickie of Aberdeen has observed something of the same kind. Mr. Ralfs, who has paid great attention to the history of these

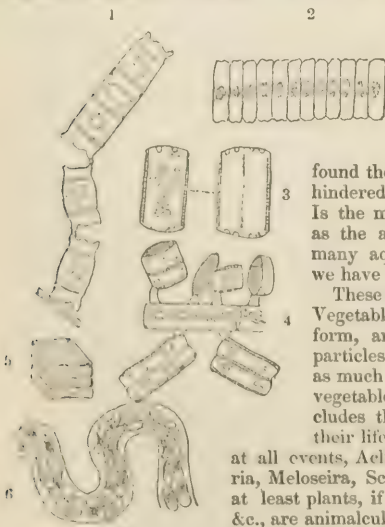


Fig. 11.

Fig. 11. — 1. Biddulphia; 2. Grammonema; 3. Eunotia; 4. Achnanthes; 5. Amphitetras; 6. Gloionema, a production once referred to this order, but determined by Mr. Berkeley to be the eggs of an insect.



dilatated creatures, observes, that one division of them, the *Cyclotella*, regularly become putrid, have a siliceous covering, and consequently their form is not destroyed in drying; they are not destroyed by fire. When in perfection they are generally hyaline, and not unfrequently become greenish when dry; they are usually of round or subtriangular or prismatic form, and often marked with striae and dots. The *Desmidiæ*, on the contrary, putrefy very slowly, have not a siliceous coat, and therefore after they slough in drying. When in perfection they are generally of an herbaceous green colour, and most frequently have the fragments divided into two portions rounded, each of other form, but sometimes differing much as to size. "This division, noticed in *Desmidiæ* mucosum merely by a shallow groove passing round the joint, and in *Denticula* supported by notches in the angles, by which it is rendered still more apparent; whilst in *Euastrum* the two portions are connected only by a central chord." (*Ann. N. H.* 11. 448.) In another place (*ib.* 13. 377) this accurate observer recognizes the putrid presence of starch among the *Desmidiæ*, which, not being an animal product, settles the question of the vegetable nature of at least that portion of *Diatoms*.

Natives of still waters, and cozy places in the northern parts of the world.

The uses of these plants to man are unknown.

### GENERA.

Suborder I. CYMATEARIA. <i>Cocconeis</i> , <i>Ulvæ</i> .		Suborder III. <i>Desm-</i>	
Individuals quite Achæateæ, <i>Bosc.</i>	Stellate, <i>Ag.</i>	Suborder IV. <i>Desm-</i>	
Two, angular, semi- circular.	<i>Amphibates</i> , <i>Ag.</i>	Suborder V. <i>Desm-</i>	
<i>Frustula</i> , <i>Ag.</i>	<i>Isthmia</i> , <i>Ag.</i>	Suborder VI. <i>Desm-</i>	
<i>Cocconeis</i> , <i>Kütz.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder VII. <i>Desm-</i>	
<i>Hyalodiscus</i> , <i>Kütz.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder VIII. <i>Desm-</i>	
<i>Cocconeis</i> , <i>Kütz.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder IX. <i>Desm-</i>	
<i>Amphibia</i> , <i>Bosc.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder X. <i>Desm-</i>	
<i>Stellate</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XI. <i>Desm-</i>	
<i>Alachia</i> , <i>Widd.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XII. <i>Desm-</i>	
<i>Monera</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XIII. <i>Desm-</i>	
<i>Lemnophora</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XIV. <i>Desm-</i>	
<i>Lemnophora</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XV. <i>Desm-</i>	
<i>Phragmotricha</i> , <i>Kütz.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XVI. <i>Desm-</i>	
<i>Desm.</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XL. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder XLIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder L. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXXI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXV. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVI. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXVIII. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXIX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXX. <i>Desm-</i>	
<i>Gomphonema</i> , <i>Ag.</i>	<i>Desm.</i> , <i>Ag.</i>	Suborder LXXXXXXXXI. <i>Desm-</i>	



## ORDER II. CONFERVACEÆ.—CONFERVAS.

Confervaceæ, *Endl. gen. Suppl. III.*, p. 10. Zoospermeæ, *J. Ag. Alg. Med.* 1. Synsporeæ and Zoospermeæ, *Décadise in Ann. Sc. N.* 2 ser. 18. 305.

DIAGNOSIS.—Vesicular, filamentary or membranous bodies, multiplied by zoospores generated in the interior, at the expense of their green matter.

Water plants, not commonly of a green colour, but occasionally olive, violet, and red; inhabiting the ocean in some instances, but more commonly found in fresh water; some of them even belonging to both kinds of fluids; some found in mud, others floating freely, most attached, in some way, on rocks or as parasites. Cells solitary or many, globose, elliptical, cylindrical, or tubular; sometimes variously branched; sometimes formed in slimy matter in which they are scattered, or irregularly heaped, or placed one above the other in a regular series forming an articulated frond; some disposed in several rows and forming a thin layer, or some combined in the form of a net. Their mode of growth by a subdivision of the cells, of ramification by a lateral extension of such cells, a dividing partition being eventually formed. The propagation by sporidia (internal cells, or a gelatinous substance which organizes itself into cells,) found in each cell, singly, or in a definite, or indefinite number, formed from the colouring matter of one or more cells, or sometimes by the copulation of distinct individuals, and discharged by the opening or absorption of the mother cell.—*Endl.*

If doubts exist as to the Vegetable nature of the last order, or of some part of it, no question arises as to what that of Confervas is. Its genera are now admitted on all hands to be plants, since M. Decaisne's important discovery of the vegetable nature of several things which had been previously regarded as Zoophytes. Nevertheless, it is curious to see how much, at one period at least of their existence, they have of an animal nature, if the power of moving from place to place is to be taken as an indication of such a quality. It seems incontestable, notwithstanding the denial of Mohl and others, that many of the Conferva tribe, especially of the genera Conferva, Ulva, and their near allies, produce in their tubular threads reproductive bodies, or spores, which after a time acquire a power of rapid, and quasi-voluntary motion while in the inside of their mother; that by degrees, and in consequence of their constantly tapping against the soft side of the cell that holds them, they escape into the water; that when there they swim about actively, just like animalcules; and at last retreating to a shady place, attach themselves to a stone or some other body, lose their locomotive quality, and thence-forward germinate and grow like plants.—(*J. Ag. Ann. Sc. Nat.* 2 ser. vol. 6.)\* It is

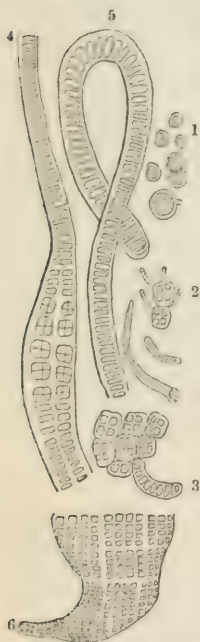


Fig. III.

Fig. III.—1. Protococcus viridis; 2. the same beginning to develop; 3. the same more advanced; 4 & 5. Schizogonium murale; 6. A fragment of Ulva (Prasiola furfuracea) (Kütz.).

\* "The filaments of Conferva ærea," says the younger Agardh, "are, as is well known, articulated or divided at equal distances into little compartments (joints), which have no communication among themselves other than what results from the permeability of the dissepiments. The green matter contained in these joints appears at first altogether homogeneous, as if it were fluid; but in a more advanced state it becomes more and more granular. The granules are, at their formation, found adhering to the inner surface of the membrane, but they soon detach themselves, and the irregular figure which they present at first passes to that of a sphere. These granules congregate by degrees in the middle of the joint, into a mass, at first elliptical, but which at length becomes perfectly spherical. All these changes are conformable to phenomena known in vegetable life; those which are to follow have more analogy with the phenomena of animal life. At this stage an important metamorphosis exhibits itself, by a motion of swarming (un mouvement de fourmillement) in the green matter. The granules of which it is composed detach themselves from the mass, one after another, and having thus become free, they move about in the vacant space of the joint with an extreme rapidity. At the same time, the exterior membrane of the joint is observed to swell in one point, till it there forms a little mammilla, which is to become the point from which the moving granules finally issue. By the extension of the membrane for the formation of the mammilla, the tender fibres of which it is composed separating, cause an opening at the end of the mammilla, and it

Fig. III.—1. Protococcus viridis; 2. the same beginning to develop; 3. the same more advanced; 4 & 5. Schizogonium murale; 6. A fragment of Ulva (Prasiola furfuracea) (Kütz.).



even asserted by M. Férussac, that in *Conferva glomerata* and *prostrata*, the spores have special organs of motion, of the nature of cilia or tentacles, and that they by their special action that the spores swim so freely in fluid. (*Ann. sci. nat.* 20: 2.) Modern authors have been misled in the Oscillatrices; and in the spores called *Zygospores*, that are so extraordinary as to appear nearly to Ob. not in suspension in water. In the language of M. Deshayes, "the spores of these plants result from the meeting of pro-



FIG. IV.

*Spirogyra*, which have been described as Conifers, and assigned to the genus *Protococcus*, are nothing more than the animalcules called *Infusoria*, *Nauplii*, and *Polyserius*. But this does not affect the genus *Protococcus*, which contains productions respecting whose vegetable nature no doubt is entertained.

*Hydrodictyon utriculatum* has the appearance of a green net. According to M. Areschoug, the cells of this plant, when nearly ripe, contain a number of active spherical granules, which in the process of reproduction become elliptical, and are attached by their extremities, when an articulation is soon produced, so as to form pentagons or hexagons. Each granule becomes a cell of the new *Hydrodictyon*. (*De Hæm. et al.* 1860.)

is by this passage that the granules escape. At first they float in a body, but soon they begin to swim, swimming in a much larger space, having much more difficulty in contact, and they are after a moment's knocking (turbulation) against the walls of their prison, that they succeed in finding an exit. From the first instant of the motion one observes that the granules or spores are furnished with a little head, a kind of anterior process, always distinguishable from the body of the body by its greater colour. It is in the vibrations of this head that the motion, as I observed, depends; at least, I have never known it to cover any cilia. However, I will not venture to deny the existence of those, for with a very high power of a compound microscope one sees the granules surrounded with a hyaline border, as we had already noticed in *Infusoria* on applying a glass of transparent paper. The granules, during their motion, almost present this head in front of their body, as it is used to show them the way; but when commencing to move, by coming it back along the side of their body, they assume the spherical form, as they have and after the motion one sees no trace of this head. The motion of the spores being that which has the least contact principally in quick distance along the walls of the water vessel, sometimes they come against them by remarkable strokes; and in some cases we are almost forced to believe that it is by the motion of the spores that the pseudocilia is formed. Escaped from their prison they continue their motion for one or two hours, and retiring always toward the darker part of the vessel, sometimes they give their wandering course, sometimes they remain in the same place, varying their form as we have already noticed. Finally, they collect in dense masses, constituting immovable groups, and which themselves constitute some extraneous body at the bottom or on the surface of the water, where they begin to develop some plants like those of the mother plant. The spherical spores disengage at first into irregularly attached to the strange body by the narrow neck. Their development only seems to be a gradual expansion, without emitting any root. The green internal matter divides in the manner of a network, which appears at first soft as a hyaline network, but which gradually assumes a firmness of texture. It is this, by successive divisions of the first net formed, that the young plant increases. The process of the mammilla in each point is uncertain, at least I have seen none of them in the same place. The exit of the spores does not take place at the same time in the different lines. After some time one of the articulations already escaped, while in the neighbouring portion was escaped completely formed. Commonly the uppermost points empty themselves first so that it is not rare to see all the plant consist of a filament entirely transparent, whilst the lower part continues still to form. It is the manner the formation and dissemination of the seeds continue during the whole summer, and then we are permitted to suppose for the formation of an infinite quantity of spores. If one remembers that each point contains perhaps many hundred of spores, it is not surprising that the entire filament probably contained with them; so that we might readily take for a *Protococcus*, or other genus. Now, what can we propose of a *Conferve*. I suspect that from such a number have arisen the names of *Conferve* proposed by many modern algologists."

FIG. IV. — *Spirogyra glomerata*, Kützinger.



Confervas are more frequently found in the temperate parts of the world than within the tropics, occupying both salt and fresh water, but more especially the latter, and several species are common to both. One of them, the *Tiresias ericetorum*, grows on the ground, but in places that are very damp, and often inundated; others among the oscillating species cover the humid surface of rocks or earth, and the interstices in the pavement of cities; some even grow in hot springs of a very high temperature. *Ulva thermalis* lives in the hot springs of Gastein, in a temperature

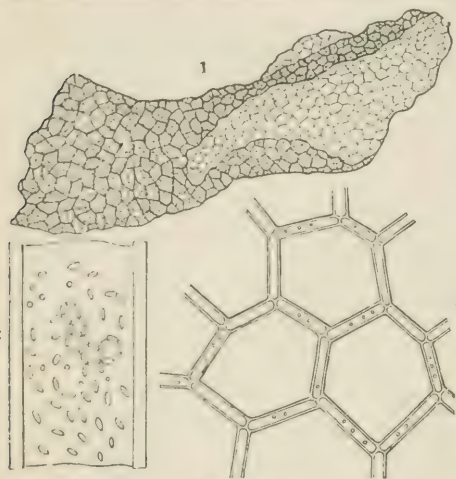


Fig. V.

of about 117° Fahr. Dr. Lankester speaks of *Oscillatorias* found in the sulphuretted hydrogen water of Harrowgate (*Ann. N. H.* vii. 107); and *Calothrix nivea* is said to have occurred there also. They often give a peculiar colour to large bodies of water. The Red Sea has derived its name from the abundance of *Trichodesmium erythraeum* which floats in it, and concerning which MM. Evonor Dupont and Montagne have given a curious account.\* Dunal states that the crimson colour of the salt-water tanks on the coast of the Mediterranean is owing to the presence of *Protooccus salinus* and *Hæmatococcus salinus*, two of the most simple of this order. *Hæmatococcus Noltii* stains crimson the marshes of Sleswick.

Dr. Drummond ascertained that the Irish lake of Glaslough, which is remarkable for its peculiar greenness, owes its colour to the presence of his *Oscillatoria aeruginosa*. (*Ann. N. H.* i. 1.) The green of the Grand-canal docks near Dublin has been found to arise from the presence of a *Sphærozyga* (*Trichormus Allm.*) and in like manner Mr. Thompson found that the water of Ballydrain lake is coloured green by *Sphærozyga* (*Anabaina*) *spiralis*, and that in the same place broad verdigris patches proceed from collections of *Aphanizomenon incurvum*. (*Ann. N. Hist.* v. 83.) It has also occurred that acres of inundated meadow land have been clothed to the depth of an inch with a thick entangled layer of *Conferva crispa*, which then forms a texture not unlike that of some woollen fabric, whence it has gained the name of water-fannel. *Confervæ* sometimes attack diseased animal tissue. Mr. Goodsir has described such an instance in the case of a gold-fish. (*Ann. Nat. Hist.* ix. 336.) It has been ascertained that this is of very common occurrence, and that the plant which makes the attack is the *Achlya proliferæ*. This production has been carefully

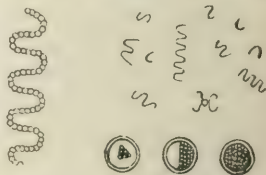


Fig. VI.

\* "On the 8th July 1843, I entered the Red Sea by the straits of Babelmandel, on board the *Atalanta* steamer. On the 15th the burning sun of Arabia suddenly awoke me with its brilliancy unannounced by the dawn. I was leaning mechanically out of the poop windows, to catch a little of the fresh air of night before the sun had devoured it, when, imagine my surprise to find the sea stained red as far as the eye could reach behind the vessel.—If I was to attempt to describe this phenomenon, I would say that the surface of the ocean was entirely covered with a close thin layer of fine matter, the colour of brickdust, but slightly orange. Mahogany sawdust would produce such an appearance.—When put into a white glass bottle, it became in the course of a day deep violet, while the water itself had become a beautiful rose colour. This appearance extended from Cosseir, off which we were at daybreak on the 15th May, to Tor, a little Arabian village, which we made about noon the next day, when it disappeared, and the sea became blue as before. During this time we must have passed through about 256 miles of the red plant." *Comptes rendus*, xix. 171.—Similar appearances have been mentioned by Mr. Darwin; and Mr. Hinds, when at anchor off Libertad in the Pacific, and at the Abrolhos, perceived large quantities of another species of *Trichodesmium*, which exhaled a most disagreeable smell. To this cause, or one of the same kind, is probably referable the phenomenon mentioned in the *Colombo Herald* of May 14, 1844: "The sea to the southward of Colombo, and, more lately, opposite the fort itself, has presented a very uncommon appear-

Fig. V.—1. *Hydrodictyon utriculatum*; 2. portion of full-grown plant; 3. portion of a joint in which the granules have commenced to dispose themselves in pentagons, the rudiments of the new plant.

Fig. VI.—*Sphærozyga spiralis*.



examined by Dr. Unger. When arrived at its full growth, it consists of numerous filaments of extreme fineness, pointed towards the ends, as the tips of setæ; they greatly resemble, in general appearance, certain kinds of smilacines. These threads are terminated by an extremely short tube of an inch in diameter, consisting of a long single cell, within which is collected green granular material, intermixed with granules.

Dr. Unger assumes us that at this time no starch is present, but the whole of the green matter is of the nature of gum, as is proved by the action of iodine upon it. The contents of the cell are seen to be in constant motion, directing themselves in lines such as are represented at Fig. 5. While this is going on, the end of the cell continues to grow, and at the same time the contents collect at the extremity, and distend it into a small head in form resembling a club, immediately after which a chamber is formed, and then the first stage of fructification is accomplished. The next change is observed to take place in the peculiar matter of the clubhead, which itself enlarges, while the contents grow opaqueness, and by degrees arrange themselves in five or six-sided meshes, which are in reality the sides of angular bodies, that are rapidly forming at the expense of the mucilage above mentioned,

which has disappeared. It is not the least surprising part of this history, that all the changes above mentioned take place in the course of an hour or an hour and a half, so that a patient observer may actually witness the creation of this singular plant. At this time all the vital energy seems directed towards changing the angular bodies in the mesh of the clubhead into propagating germs or spores. Meanwhile the clubhead grows, and gives them a little room, and they in their turn alter their form and become seeds. Then it is that is witnessed, the surprising phenomenon of spontaneous motion in the spores, which, notwithstanding the narrow space in which they are born, act with such vigour that at last they force a way through the end of the clubhead. At this time a spore gets out into the water, then another, and another, till at last the clubhead is emptied. All this takes place with such rapidity that a minute or two suffice for the complete evacuation of the clubhead or spore-chamber. The spores, when they find their way into the water, are generally egg-shaped, and swim with great swiftness and firmness; but they are often deformed, in consequence of the narrowness of the hole through which they have had to pass. It even happens that they stick fast to the sides, and perish there. They are extremely small, their breadth not exceeding the length

after for some days past. Instead of its usual brightness, the surface had lost its greenish tinge, and seemed with what appears to the naked eye a sort of dirty film, or haze, consisting of fine granules, by no means fine, when it has been usually calm, this seems has presented itself in broad white patches, such as the afternoon, after being exposed to the sun breeze, it is broken down into streaks like smoky clouds at the wind, which, if it blows pretty fresh, disperses it altogether. We have observed some of this unusual substance in a tumbler of salt water, and were not a little surprised to find that some of it rising on the surface, in the form of a foam, some parts of a yellowish green, and some of a purple-brown colour, it tinged the whole water of a beautiful violet. We afterwards found that the whole foam in the bucket, in which it was brought from the sea, had imparted the same colour to the water. It appeared to us the other day, when it was very abundant, as if the sea itself had been covered with this beautiful tinge. We found, on minute inspection, that it consisted of an infinite number of small spore-shaped bodies, each of which, in its turn, was a kind of small spore-shaped body, but somewhat, and seemingly very brittle. We have no doubt but that it is a vegetable production of the sea, somewhat similar to the green substance which covers the smooth parts of fresh water. The most remarkable and unpleasant feature is its foetid odour. When we read in books of reports of disgusting and noxious fumes through seas of a blood colour, and similar wonders, we might imagine the author to be talking the liberty of a traveller; but witnessing such a phenomenon as this, it becomes no longer an act of giving them more credit."

Fig. VII. *Achlya prolifera*.—1. The club-shaped spore-chamber; 2. the same, expanded at its extremity; 3, 4. as spore-chamber much less magnified, containing the surrounding medium and a short tube; 5. a piece of the thread at an early period, with the lines of motion.



part of an inch. Their small end is the most transparent, and it is curious to see how constantly this is pushed forwards in the rapid evolutions made in the water by these living particles. This sort of *quasi* animal life does not last long—a few seconds, some minutes, or at the most half-an-hour. They often die : Unger assures us that he has seen them in the agonies of death, and *struggling convulsively* (!), with all the appearance of animal life.

*Porphyra laciniata* and *vulgaris* are stewed, and brought to our tables as a luxury, under the name of Laver; and even the *Ulva latissima*, or green Laver, is not slighted in the absence of the *Porphyrae*. *Ulva compressa*, a common species on our shores, is regarded, according to Gaudichaud, as an esculent by the Sandwich Islanders. Common Nostoc, commonly called star-jelly, a trembling gelatinous plant, that springs up suddenly after rain, is by superstitious persons supposed to possess virtue as a vulnerary, and in pains of the joints; oyster green or *Ulva lactuca* (the *βρίον θαλάσσιον* of Dioscorides) is sometimes employed in scrofula; the ancients used it in inflammations and gouty affections; its taste is so bitter and salt that it is usually given with lemon juice.

The Confervals found in many thermal springs, mostly species of *Sphærozyga*, are used empirically as external applications to goitre, enlarged glands, &c. Henry has examined the Confervals in the springs of Vichy, Neris, and Vaux, and found small quantities of an alkaline iodide in each. (*Chem. Gaz.* 1844, p. 447.)

### GENERA.

Suborder I. — *Palmetaceæ*. Cells somewhat globose or elliptical, free, and more or less distinct, or collected by means of a slimy layer into a frond.

Tribe 1. *Protococcidæ*. — The slimy substratum obsolete.

*Protococcus*, Ag.  
*Sphaerella*, Sonn.  
*Coccolithum*, Link.  
*Globulina*, Turp.  
*Protosphaeria*, Turp.  
*Hemitococcus*, Ag.  
*Gloioecium*, Shutt.  
*Chlorococcum*, Græ.  
*Globulina*, Turp.  
*Pseudosphaeria*, Turp.  
*Phaeococcus*, Menegh.  
*Hormospora*, Bréb.  
*Stereococcus*, Kütz.

Tribe 2. *Coccolithidæ*. — The slimy substratum evident.

*Palmetta*, Lyngh.  
*Priestleya*, Meyen.  
*Chloa*, Bory.  
*Phytoconis*, Bory.  
*Coccolith*, Pal.  
*Mertellia*, Gray.  
*Sarcoderma*, Ehrh.  
*Coccolithis*, Spr.  
*Microcystis*, Kütz.  
*Rhodalia*, Turp.  
*Anacystis*, Menegh.  
*Oncobrysa*, Ag.  
*Hyalococcus*, Kütz.  
*Micraloa*, Blass.  
*Hydrothrombium*, Kütz.  
*Botrydia*, Brébiss.

Suborder II. — *Nostochidæ*. Cells somewhat globose or elliptical, coalescing into a simple or branched thread; united into several rows by means of a slimy substratum of various forms.

*Nostoc*, Vauch.  
*Leuckia*, Mich.  
*Ulothrix*, Fries.  
*Hydrococcus*, Link.

*Thrombium*, Wallr.  
*Monormia*, Berkel.  
*Sphærozyga*, Ag.  
*Anabaina*, Bory.  
*Trichormus*, Allm.  
*Anhaltia*, Schwabe.

Suborder III. — *Oscillatoridæ*. Cells tubular, naked or furnished with a slimy or gelatinous layer, continuous, but seeming to be jointed in consequence of interruptions of the colouring matter.

Tribe 1. *Rivularidæ*. — Tubes proceeding singly, or in pairs, from a transparent globule; collected into a frond by means of a gelatinous layer.

*Gloioctrichia*, J. Ag.  
*Rivularia*, Roth.  
*Lynckia*, Lyngh.  
*Gaillardetella*, Bory.  
*Sphobasis*, Schw.  
*Stygnion*, Raf.  
*Zonotrichia*, J. Ag.  
*Diploctrichia*, J. Ag.

Tribe 2. *Oscillatoridæ*. — Tubecylindrical, free, or woven into a frond, falsely jointed in consequence of the ringed or streaked appearance of the colouring matter.

*Oscillatoria*, Bosc.  
*Oscillaria*, Bosc.  
*Trichophora*, Bonnem.  
*Spirogyra*, Nees.  
*Spirulina*, Turp.  
*Lolen*, Adams.

*Trichodesmium*, Ehrenb.  
*Microcoleus*, Desmaz.  
*Vaginaria*, Bory.  
*Mericomyria*, Poll.  
*Calothrix*, Ag.  
*Hempelia*, Meyen.  
*Ulothrix*, Kütz.  
*Dilwynella*, Bory.  
*Lynckia*, Ag.  
*Cyclosperma*, Bonnem.  
*Humida*, Gray.  
*Seytonema*, Ag.

*Percursaria*, Bonnem.  
*Sphaeroplea*, Ag.  
*Cadmus*, Bory.  
*Sphaerogona*, Link.  
*Sphaeroplethia*, Duby.  
*Beggiatoa*, Trev.

Suborder IV. — *Confervidæ*. — Cells resembling joints, arranged in a net, or more frequently in simple or branched threads, separate, or combined by common slime.

Tribe 1. *Hydrodictidæ*. — Cells tubular, combined by their pointed extremities into a net-like frond.

*Hydrodictyon*, Roth.  
*Microdictyon*, Decaisne.  
*Dictylena*, Raf.  
*Talerodictyon*, Endl.

Tribe 2. *Zygnemidæ*. — Cells tubular, united by their truncated extremities into jointed threads, which are at first distinct, and then, by the aid of transverse tubelets which discharge the colouring matter, brought into copulation.

*Mougeotia*, Ag.  
*Serpentinaria*, Gray.  
*Conjugata*, Lk.  
*Zygnema*, Ag.  
*Agardhia*, Gray.  
*Globulina*, Lk.  
*Stellulina*, Lk.  
*Lucernaria*, Roussel.  
*Diadema*, Pal.  
*Tyndaridea*, Bory.  
*Leda*, Bory.  
*Spirogyra*, Lk.  
*Choaspis*, Gray.  
*Salmacis*, Bory.

Tribe 3. *Confervidæ*. — Cells tubular, united by their truncated extremities into free, simple, or branched threads.

*Myxonema*, Fries.  
*Myxotrix*, Fries.  
*Nematrix*, Fries.

*Conferva*, Fries.  
*Polysperma*, Vauch.  
*Chloroniton*, Gaill.  
*Hormiscia*, Fries.  
*Nodularia*, Mertens.  
*Aphanizomenon*, Morren.  
*Tiresias*, Bory.  
*Edogonium*, Lk.  
*Draparnaldia*, Bory.  
*Charospermum*, Lk.  
*Leptomitia*, Ag.  
*Saprolegmia*, Nees.  
*Pythium*, Nees.  
*Sphaerotilus*, Kg.  
*Achlya*, Nees.  
*Hydronema*, Carus.  
*Hygrocrocis*, Ag.

Tribe 4. *Chætophoridæ*. — Cells tubular, adhering by truncated extremities in jointed branched threads coalescing into a gelatinous frond.

*Chætophora*, Schrank.  
*Myriodactylon*, Desv.  
*Hydrocoryne*, Schwab.  
*Coleochæte*, Bréb.

Suborder V. — *Siphonocæ*. Frond either monosiphonous, that is, consisting of a single cell, usually branched in various ways, with the branches continuous or jointed, distinct or variously united; or pleiosiphonous, consisting of many tubular cells, placed in contact, branched, and variously united or held together by means of intercellular matter. — Marine plants usually covered with calcareous incrustations.

Tribe 1. *Caulerpidæ*. — Frond monosiphonous, continuous, variously branched, and filled with the reticulated fibres of the continuous branch.  
*Caulerpa*, Lamx.  
*Chauvinia*, Bory.  
*Tricladia*, Dec.



[illegible]

NUMBERS, GEN. COL. SP. 1901, (E. H.)

POSITION.—Diatomaceæ. CONFERVACEÆ—FUCACEÆ.

*Chlorospermea*, *Huxley British Marine Algae*, p. 2

A tendency to a quaternary division has been remarked by Mr. Thwaites in *Mesocarpus scabrus*, *Tyndarodes insignis*, and *Stauracarpus gracilis*; the separation into 4 parts does not take place till the fruit is nearly mature. (4 vol. *N. H. N. III*, 263.) A fissiparous mode of formation of the spores in *Vesiculastrum concolor* has been described by the same acute observer at p. 534 of the work just quoted.

The discovery of the spermatozooids of Liliens, by M. Irzingshm, which has led to such interesting results in the hands of M. Tulaue, naturally induced the author to extend his researches in other directions. In a letter addressed to M. Tulaue, in 1852, and which is published in the *Annales des Sciences Naturelles*, he announces the discovery of spermatozooids in *Spirogyra* and in *Conferva glomerata*, and in the *Potsdamer Zeitung*, for the 25th of March, and 1st of April, of the present year, he has given a fuller report of his discovery, accompanied by numerous figures. When conjugation is commencing in the *Spirogyra*, but apparently not in the conjugating threads themselves, he finds the spiral band of endochrome gradually resolved, more or less completely, into a number of distinct globose sacs (called by the author spermatoospheria), within whose cavity numerous globules are formed, whether furnished with a distinct cellular wall or not is uncertain, each of which gives rise to a spiral body endowed with active motion, resembling strongly the spermatozooids of mosses. These bodies, if kept in water increase greatly in size, a circumstance which requires further observation. He detected the same organisms in *Conferva glomerata*, and indicates bodies apparently identical with the above mentioned mother-cells in *Edogonium*, *Monostroma*, and *Bulbochorda*, though in these genera he has not hitherto ascertained the existence of the spermatozooids. In *Vaccinium* he has also observed mother-cells, but the spermatozooids appear to assume a different form. The parent cells are themselves endowed with motion. No resting cells have at present been found upon the spermatozooids. They have not, however, been examined under the most favourable circumstances for the discovery of these delicate organs.

#### ADDITIONAL GENERA.

[illegible]



## ORDER III. FUCACEÆ.—SEaweEDS.

Phycœe, *Encl. Gen. Supp.* iii p. 19. (1843).—Aplosporeæ, *Decaisne in Ann. Sc. Nat.* 2 ser. 17, 305.

DIAGNOSIS.—Cellular or tubular unsymmetrical bodies, multiplied by simple spores formed externally.

Plants sometimes inhabiting fresh water, but more frequently salt water; the former approaching closely to Confervas. Frond either monosiphonous, consisting of a single cell, which is sometimes uninterruptedly branched, or more commonly polysiphonous, composed of several cells, various in form, placed one above the other, or interwoven, barked or barkless, jointed or continuous, thread-shaped, or of various figures, and not uncommonly divided into a sort of trunk and leaflike blade. Mode of growth by division of the cells; of branching by lateral increase or a vague proliferousness. Mode of propagation by spores, contained in superficial cells, which are often bladderlike (and called VESICLES), growing singly out of thin colouring matter, consisting of a single nucleus clothed by its proper cellular membrane (or EPISPORE), and discharged by the opening of a transparent mother cell (or PERISPORE). VESICLES (or original mother cells) scattered through the whole frond, or seated in particular parts of it, (often the points of the branches), sometimes on a peculiar receptacle, naked, or supported by small branches.—(*Endlicher.*)

The reproductive bodies of these plants distinguish them from others of the alliance. In the words of Decaisne "they are simple, and result neither from a modification of green matter, nor from its concentration in a pre-existing cell; their structure is quite peculiar. In the beginning they are little warts, invested by a very thin membrane, placed close over an inner sac filled with green granules." (The black or brown colour assigned to them by Mr. Harvey is a mistake arising out of imperfect observation.) "All the spores are external, that is to say, inserted on the surface of a vesicle upon which they are generated. They are never found in the interior of the frond as in Confervas; and if in Seaweeds they can be compared, in consequence of their being contained in a common chamber or conceptacle, to the spores of certain Rosetangles, it can only be to the corpuscles enclosed in the organs named Ceramidia by the younger Agardh, which however never have the double integument of Seaweeds. In most of the latter the spores appear at the base of certain florets or filaments, which are simple or jointed, thread-shaped or dilated, or more or less filled with green matter; these florets are wanting however in the greater part of the Dictyotidæ, and their use is wholly unknown. There is no reason to suppose them male organs." Decaisne, indeed, in one place, treats as an absurdity Donati's calculation that a single individual of a *Cystoseira* (Acinaria) bears 545,000 male flowers and 1,728,000 females.

The younger Agardh, however, has within a few months expressed his deliberate opinion that in the Rosetangles (his Floridæe) organs analogous to sexes are present. "I am very much inclined," he says, "to adopt the opinion that the two sorts of fructification observable among them are the first attempts at the agency which in higher plants perform the office of sexes, without however having their qualities established, and each capable of producing a new plant without the aid of the other." See his pamphlet called *In systemata Algarum hodierna Adversaria* (p. 8.) in which the reader will find abundant criticism of the views of Kützting and others concerning the Algal alliance.

M. Decaisne seems also to have altered his opinion upon this subject, for (*Comptes Rendus*, Nov. 11, 1844.) he and M. Thuret now describe what they suppose to be sexual organs in *Fucus serratus*, and other species, to which they even apply the Linnean names Monœcious and Dioecious. They describe the conceptacles of the males as being filled with articulated filaments bearing numerous antheridia in the form of vesicles containing red granules. "These antheridia are expelled by the orifice of the conceptacles; if we examine them with a microscope, we see issue from one of their extremities transparent somewhat pear-shaped bodies, each enclosing a red granule. Every one of such bodies is furnished with very thin ciliæ, by means of which it moves with very great

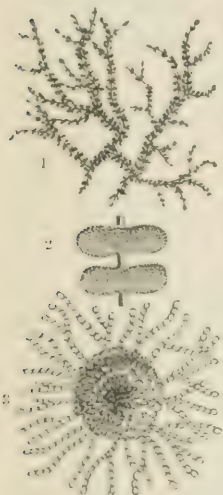


Fig. VIII.

FIG. VIII.—1. *Batrachospermum moniliforme*; 2. portion of a branch; 3. summit of a branch, bearing a cluster of spores. (*Decaisne.*)



activity? Such ladies are regarded as antitheses to the speed threads of women and other cryptogamic plants. Indeed, according to M. Marten, such threads are now distinguished with solitary locomotive organs. But what proof is there that these common ladies are pollen?

One of the most remarkable plants of the order is the *Hydrocoleum*, which Lindcler describes as a perfect plant, with root, stem, leaf, and fruit, in relation to the most highly developed ferns, but all growing by the branches of one single cell.



Fig. 1X.

Professor Marten thinks that he has ascertained that the amoeboid called *Rhizoid* collects, is actually generated in the cells of *Vanthoria ulvata*. It lives in certain protuberances formed on the stem of that plant, travels quite at its own will within them, traverses the papillae, disposes the colouring matter. (See *Nat. Hist. Scand.*)

Like all this order the *Sargassum* have no particular geographical limits, but soon wherever the ocean or rivers spread themselves over the land. They are, however, remarkable for the enormous space which single species of them occasionally occupy; some of them forming extensive forests in the ocean, emulating in their gigantic dimensions the boundless element that surrounds them. *Seytosphonium*, a species common to the North Sea, is frequently found of the length of 30 or 40 feet; in *Scalpa Bay*, in Orkney, according to Mr. Neill, this species forms *turres* or towers, through which a pinnacle with difficulty figures its

way. *Lessonia fuscousus* is described by Bory de St. Vincent as 25 or 30 feet in length, with a trunk often as thick as a man's thigh. But all these, and indeed every other vegetable production, is exceeded in size by the prodigious forests of *Macrocystis pyrifera*. "This appears to be the sea-weed reported by navigators to be found but to 1500 feet in length; the leaves are long and narrow, and at the base of each is placed a vesicle filled with air, without which it would be impossible for the plant to support its enormous length in the water; the stem not being thicker than the leaves, and the upper branches as slender as common parchment." This plant, and *Macrocystis utilis*, was seen by Dr. Joseph Hooker in lat. 61° S. in large vegetating patches, wherever the water was free of icebergs; and *Seytothalia Jacquinotii* as low as 60° S.

Some of the species are eatable, owing doubtless to the large quantity of gelatinous matter that they secrete. The young stalks of *Laminaria digitata* and *Sargassum* are eaten under the name of "tangle." In Asia, *Sargassum acanthocarpum* and *pyrifera*, with *Laminaria bracteata*, and in the Sandwich Islands, *Sargassum cuneifolium*, are also used for food. When stripped of the thin part, the beautiful *Maris asperula* forms a part of the simple fare of the poorer classes of Ireland, Scotland, Iceland, Denmark, and the Faroe Islands. The large *Laminaria patersonii* of Australia furnishes the aborigines with a proportion of their instruments, vessels, and fuel. On the island of Bory de St. Vincent, the *Durvillea utilis* and other *Laminaria* constitute an equally important resource to the poor on the west coast of South America. In some of the Scottish islands, horses, cattle, and sheep, feed chiefly upon *Fucus vesiculosus* during the winter months; and in Greenland it is commonly given to pigs. *Ulva lactuca* also, and *Seytosphonium filum*, constitute a part of the fodder upon which cattle are supported in Norway. In the manufacture of kelp, for the use of the glass-maker and soap-boiler. Sea-weeds take their place among the more useful vegetables. The species most valued for this purpose are, *Fucus vesiculosus*, *indusius*, and *serotinus*, *Laminaria digitata* and *bulbosa*, *Himanthalia lorea*, and *Seytosphonium filum*. It is generally, indeed, because of the quantity of soda which they contain that they are treated as manure as manures. In medicine they have been occasionally employed, as, for instance, *Fucus vesiculosus* in Europe against scrofula, *Sargassum vulgure* in Persia, *Laminaria calculus*, and *Sarg. bacciferum* with some *Laminarias* in South America against tumours and strangury. But whatever medical value they possess seems to be owing to the presence of Iodine, which may be obtained either from the plants themselves, or from kelp. French kelp, according to Sir Humphry Davy, yields some iodine than British; and, from some experiments made at the Cape of Good Hope, *Fucus baccinalis* is found to contain more than any European sea-weed. Iodine is known to be a



powerful remedy in cases of goitre. The burnt sponge formerly administered in similar cases, probably owed its efficacy to the Iodine it contained; and it is also a very curious fact, that the stems of a sea-weed are sold in the shops, and chewed by the inhabitants in South America, wherever goitre is prevalent, for the same purpose. This remedy is termed by them Palo Coto (literally, goitre-stick), and consists of fragments of the *Sargassum hacciferum* and *Laminarias* above alluded to. Iodine is principally obtained in Europe from the ashes of the *Fuci vesiculosus*, *nodosus*, *ceranoides*, and *serratus*.

### GENERA.

#### Suborder I.—*Vaucheria*.

Frond mono- or polysiphonous, without bark. The utricles forming a lateral branchlet, proceeding either from the upper joint of the branch, or occasionally from the lowest.

Tribe 1. Hydrogas-tridae.—Frond produced from a single vesicle or tube, rarely from several that are continuous and loosely interwoven.

*Hydrogastrium*, Desv.  
*Hydrocladum*, Wallr.

*Rhizococcus*, Desmaz.

*Vaucheria*, D. C.

*Ectosperma*, Vauch.

*Hyropsis*, Lamx.

*Valonia*, Ginnab.

*Phyrgium*, Raf.?

*Codium*, Stack.

*Lamarkia*, Olivi.

*Agardhia*, Cabrera.

*Spongodium*, Lamx.

Tribe 2. Dasycladidae.—Frond monosiphonous, continuous, or jointed, with verticillate branchlets, which are fusiform, pinnate, and have the last joint transformed into a vesicle.

*Chamædoris*, Mont.

*Dasycladus*, Agh.

*Myrosodium*, Raf.

*Xcomeris*, Lamx.

*Cymopolia*, Lamx.

Tribe 3. Ectocarpidae.—Fronds jointed, consisting of a single row of cells, variously branched. Vesicles derived from one joint, either at the end of the branches, or of the laterals.

*Leiblinia*, Endl.

*Desmarestella*, Bory.

*Chamærasia*, Fries.

*Anticlinella*, Bory.

*Goniataria*, Rons.

*Ectocarpus*, Lyngb.

*Lyngbyella*, Gailion.

*Macrocarpus*, Bonnem.

*Ectosperma*, Raf.?

*Calosperma*, Raf.?

*Pachella*, Bory.

*Lyngbyella*, Bory.

*Bathochete*, Agh.

Tribe 4. Batrachospermidae.—Frond polysiphonous, composed of a primary thread surrounded by parallel accessory ones. Vesicles

terminal or lateral, clustered.

*Batrachospermum*, Roth.

*Charospermum*, Lk.

*Drapsarnalia*, Bory.

*Moullina*, Bory.

*Thorina*, Bory.

*Laminaria*, Bory.

*Galatinaria*, Roussel.

*Torularia*, Bonnem.

*Liagora*, Lamx.

*Actinotrichia*, Decaisne.

*Galaxaura*, Lamx.

*Dichotomaria*, Lamx.

*Atysium*, Agh.

*Microthoe*, Dec.

*Thorea*, Bory.

*Polycomia*, Palis.

*Myriocladia*, J. Agh.

*Egira*, Fries?

Tribe 5. Chordaridae.—Frond polysiphonous, with floccs proceeding in all directions from the medullary substance, free in the circumference.

*Cruria*, Fries.

*Myrionema*, Grev.

*Elachista*, Aresch.

*Mesozonia*, Agh.

*Chordaria*, Agh.

*Leathina*, Gray.

*Corynephora*, Agh.

*Clavella*, Bory.

*Liebmannia*, J. Agh.

Suborder II.—*Halyseris*.

Frond polysiphonous, barked, jointed, or continuous. Vesicles scattered over the surface of the frond, or collected into heaps.

Tribe 1. Sphacelariidae.—Frond jointed; vesicles lateral, solitary.

*Sphacelaria*, Lyngb.

*Delissella*, Bory.

*Lambyella*, Bory.

*Myriotrichia*, Harvey.

*Cladostephus*, Agh.

Tribe 2. Dictyotidae.—Frond continuous, membranous. Vesicles supported by floccs, collected in heaps, or scattered over the upper surface of the frond.

*Halyseris*, Targ.

*Neurocarpon*, Web.

*Dictyopteris*, Lamx.

*Polyptotoides*, Stack.

*Dictyosiphon*, Grev.

*Dictyota*, Lamx.

*Zonaria*, J. Agh.

*Stiffia*, Nardo.

*Zanardinia*, Nardo.

*Padina*, Adams.

*Trattinickia*, Web.

*Padinella*, Aresch.

*Cutleria*, Grev.

*Arthrocladia*, Duby.

*Elaiocema*, Berk.

*Scytosiphon*, Agh.

*Chorda*, Stack.

*Filum*, Stack.

*Chordaria*, Agh.

*Soranthera*, Postels.

*Punctaria*, Grev.

*Asperococcus*, Lamx.

*Encetium*, Agh.

*Hydroclathrus*, Bory.

*Striaria*, Grev.

*Carmichaelia*, Grev.

*Stilophora*, J. Agh.

? *Hildenbrandia*, Nardo.

*Ralsfia*, Berk.

Tribe 3. Laminariidae.—Frond continuous, coriaceous, sometimes bearing bladders. Vesicles scattered, or collected in heaps, supported by floccs, growing on both sides of the frond.

*Lessonia*, Bory.

*Macrocystis*, Agh.

*Nereocystis*, Postels.

*Ecklonia*, Hornem.

*Laminaria*, Lamx.

*Gigantea*, Stack.

*Saccharina*, Stack.

*Muscifolia*, Stack.

*Polyschidia*, Stack.

*Palmaria*, Lk.

*Laminastrum*, Duby.

*Fusciata*, Gray.

*Capen*, Montagn.

*Haligeria*, Dec.

*Alaria*, Grev.

*Orgyia*, Stackh.

*Thalassophyllum*, Post.

*Agarum*, Grev.

*Myriotrema*, Lappyl.

*Costaria*, Grev.

Tribe 4. Sporochnidae.—Frond continuous, between cartilaginous and membranous, floccs formed astride a capitate receptacle, bearing the vesicles.

*Sporochnus*, Agh.

*Desmarestia*, Lamx.

*Desmia*, Lyngb.

*Dichlora*, Grev.

*Trinitaria*, Bory.

*Hippurina*, Stack.

*Hyalina*, Stack.

*Flagellaria*, Stack.

Suborder III.—*Fucce*.

Frond polysiphonous, often bladderly. Vesicles seated in hollow conceptacles formed of

a folding in of the frond, pierced by a pore, and surrounded by floccs; conceptacles scattered or collected upon a receptacle.

Tribe 1. Lemanidae.—Frond hollow, wholly converted into a receptacle.

*Lemanea*, Bory.

*Nodularia*, Link.

*Gongycladon*, Link.

*Trichogonea*, Palis.

*Vertebraria*, Rouss.

Tribe 2. Fucidae.—Conceptacles not collected upon a receptacle.

*Fucus*, L.

*Cervina*, Gray.

*Halidrys*, Stack.

*Bifurcaria*, Stack.

*Ozothalia*, Dec. and Th.

*Pelvetia*, Dec. and Th.

*Carpodemia*, Grev.

*Myriodema*, Dec.

*Himantalia*, Lyngb.

*Lorea*, Stack.

*Xiphophora*, Montagn.

*Spurichidium*, Grev.

*Durvillea*, Bory.

*Hormosira*, Endl.

*Moniliformia*, Lamx.

*Monilia*, A. Rich.

*Castralia*, A. Rich.

*Scaberia*, Grev.

Tribe 3. Cystoseiridae.—Conceptacles or receptacles distinct from the frond.

*Coccolophora*, Grev.

*Halidrys*, Lyngb.

*Siliquaria*, Gray.

*Blossevillea*, Dec.

*Cystophora*, J. Agh.

*Cystoseira*, Agh.

*Acinaria*, Targ.

*Machaia*, Gray.

*Catenaria*, Raf.

*Ascophylla*, Stack.

*Ericaria*, Stack.

*Monilifera*, Stack.

*Sargassum*, Rumph.

*Baccularia*, Gray.

*Halochloa*, Kütz.

*Myagropsis*, Kütz.

*Spongocarpus*, Kütz.

*Turbinaria*, Bory.

*Carpacanthus*, Kütz.

*Phyllospora*, Agh.

*Carpophyllum*, Grev.

*Marginalia*, A. Rich.

*Stactothalia*, Grev.

*Stactousia*, Lamx.

*Seirococcus*, Grev.

*Polyphacum*, Agh.

*Osmundaria*, Lamx.

NUMBERS. GEN. 81. Sp. 452. (Endl.)

POSITION.—Confervaceæ. FUCACEÆ.—Ceramiceæ.



Melanosporeum. *Hantz. British Marine Algae*, p. 3.

M. Thuret thus describes the antheridia, or spermated male organs of these fungi:

"The fructification of *Fucus* is contained in little apical cavities, covered beneath the epiderm, and called conceptacles. Completely closed at first, the conceptacles open eventually at the surface of the frond by a little pore or mouth (ostiolum) through which the reproductive bodies escape. Their exit is assisted by the hairs which line the conceptacles, and which all converge towards their mouth. These hairs are jointed and branched. It is they which support the antheridia. This is at their base that the spores are fixed. In certain species spores and antheridia are found in the same conceptacle; in others, on the contrary, these two organs are produced in different conceptacles, and on different individuals. Usually immediately below the mouth is found a row of thicker hairs, which close the entrance and sometimes extend beyond it, in the form of a small spot.

"The antherids consist of little oval transparent sacs, inserted in great numbers on the hairs of the conceptacle. When they are young, we find in them nothing



FIG. IX. A.

more than a granular colourless matter; afterwards this matter decomposes into little bodies which form a greyish mass, sprinkled with orange points; these are the antherozoids, which are so packed that neither form nor structure can be perceived. The antherids of *Fucus*, *Oosthella*, *Polysilla*, and *Himantothalia*, have a double envelope; that is to say, the transparent sac in which the antherozoids are immediately contained, is itself enclosed in another sac of the same size and degree of transparency. The latter remains fixed to the hair on which it is produced; the other is expelled through the summit of the first, and falls into the conceptacle.

FIG. IX. A. Piece of the frond of *Fucus platyrrhizus* fructified with *Melanosporeum* (magnified); 2, section of a conceptacle much magnified; 3, jointed branching hairs produced from the side of the conceptacle and bearing antherids; 4, an antheridium; 5, an antheridium with only one antherozoid left in it; 6, Antheridia—after Thuret.



whence it glides as far as the mouth. The antherozoids which completely fill it, with the exception now and then of the two extremities, soon begin to be violently agitated; and then the sac opens at either one or both ends, gives them a passage, and they disperse in the water. In *Halidrys*, *Pycnophycus*, and *Cystoseira*, the second envelope of the antherid is absent; the outer sac only is found attached to the jointed hairs, and the antherozoids are expelled directly from it in a mass; for some time they remain clustered in a bunch, struggling and turning upon one another before dispersing in the liquid.

"The antherozoids are very minute hyaline bodies, their length not exceeding the 200th of a millimetre. Each contains a granule of a greyish colour in *Pelvetia*, orange red in all the other genera: it seems sometimes to project from the surface; but this is probably a mere optical delusion. The locomotive organs consist of two very fine threads of unequal length. The form of these bodies and the arrangement of the threads is not exactly the same in all *Fucaceæ*. Thus in *Fucus*, *Ozothallia*, and *Pelvetia*, the antherozoids are in the form of a little bottle, whose neck, which is always foremost, bears the shorter thread, while the longer proceeds from the red granule, and is dragged after it while the body is in motion. *Halidrys*, *Pycnophycus*, and *Cystoseira* present an opposite arrangement: the body of the antherozoid appears ovate or spherical in one direction, compressed and sometimes rather convex in another; the two threads are inserted on the red granule, and during locomotion, the body turns upon itself, carrying before it the longer thread which it moves rapidly, while the shorter is motionless. The antherozoids of *Himanthalia* have the same structure as those of the three last genera, although the antherids have a double covering as in the three first. Finally, it must be observed that the form of these bodies is not very neatly defined; they are often combined in small irregular masses; sometimes no orange point is to be found; sometimes there are two. The movements are in general very active, and last for many hours; when they begin to slacken, the undulations of the threads become plainly visible. They cease in fresh water, as well as under the action of iodine, acids, &c. If brought into contact with ammonia the antherozoids dissolve, the orange granule alone remaining.

"The antherids continue to follow each other for a long time, the same conceptacle containing at the same time young, completely formed, and empty ones. *Halidrys* siliquosa seems to me to be the only exception. It is to be observed that empty sacs are to be found in conceptacles, the mouth of which is still closed. In *Fucaceæ* when the spores and antherids are produced on different plants, those which bear the latter are known by the yellowish colour they communicate to the receptacle or part of the frond where the conceptacles are collected. If fronds in this state are long exposed to contact with air, small orange-coloured protuberances are seen to form at the orifice of each mouth; these protuberances are viscid and entirely composed of antherids. The same effect is produced by spores, which accumulate at the entrance of the conceptacles in little olive-coloured heaps. This phenomenon is very remarkable when one examines the rocks of the coast at low water in winter; especially if the weather is calm and moist: it gives *Fucus vesiculosus* and *serratus*, the two commonest species, a most singular appearance. If the fronds of a *Fucus* covered with orange-coloured protuberances are washed in sea water, the water becomes loaded with such a quantity of antherozoids, that it acquires a very bright orange colour, and every drop contains hundreds or thousands of these bodies. If the vessel is then placed near a window the water soon becomes clear, and the antherozoids collect on the lightest side, or sometimes on the darkest."

M. Thuret further observes, that although in some respects the antherozoids would appear to have some fecundating property, yet their resemblance to the zoospores of *Pheosporous* Algae is such as to raise a doubt concerning their real nature. For further details the reader is referred to M. Thuret's memoir in the *Annales des Sciences Naturelles*.

#### ADDITIONAL GENERA.

HYDROGASTRIDE.  
*Derbesia*, *Solier*.  
*Cladothale*, *Harv*.  
*Struvia*, *Sonder*.  
CHORDARIDE.  
*Ralfsia*, *B. & E.*

*Elachista*, *Griseb*.  
*Seytothamnus*, *Hook*.  
*f. et Harv*.  
*Epineum*, *Harv*.  
*Cylindrocarpus*,  
*Crouan*.

DICTYOTIDE.  
*Pinnaria*, *Endl*.  
*Stereocladon*, *Hook*.  
*f. et Harv*.  
*Adenocystis*, *Hook. f.*  
*Taonia*, *J. Ag.*  
*Litosiphon*, *Harv*.

FUCIDE.  
*Pelvetia*, *Thuret & Dec.*  
*Platythalia*, *Sonder*.  
CYSTOSEIRIDE.  
*Contarinia*, *Endl*.  
*Phacelocarpus*, *Endl*.



## ORDER IV. CERAMIACTES. Ross, 1892.

Горбачев, J. A. *Известия АН УССР, Сер. Физ.-математ. науки*, 1962, № 1, с. 114-115.

DIAGNOSIS.—*Callosity or tubercle may present a similar, multiplied*

Seaweeds of a rose or purplish colour, reddish olive or violet. The cells large, tubular, or round and short, or polygonal; sometimes arranged in a regular row.



1. A

times disposed in several parallel rows and of equal length, forming an arc, or a row, sometimes in several rows, and of unequal length, when they constitute a column type. The propagation is by means of spores, but also Sphaerospores and Tetrads (2, 4, 8, 16) in fours (or threes), within a transparent capsule, or another cell, and collected in groups of many different forms and structures.

The subdivision of the reproductive bodies or tetraspores into four, or occasionally three, particles, is the great feature of this natural order, and at once distinguishes it from the rest of the alliance. M. Deane has great stress upon this point, first used by himself for systematical purposes, and he attaches quite a secondary value to the various numbers in which such spores are grouped. To most of those modes more highly developed are the

plus haute est une structure qui n'a d'autre importance que celle, plus élevée, d'être plus facile à saisir qu'elle paraît. It is, however, a very striking possibility of the Rosetangles, that they should have so much greater a variety of functions than their allies, and this, in connection with the quaternary structure of their spores, seems to indicate their being the highest form of the Algal alliance.

Although the subdivision of the spores by four is of uniform occurrence among these plants, yet it takes place in different ways, and is subject to certain modifications, concerning which the language of M. Decaisne is instructive. "I have shewn," he says, "in another place, that the sphaerospores, or quaternary reproductive bodies, which M. Kützing has perhaps better called Tetraspores, offer three modifications. They are either little spheres, which divide into four wedge-shaped particles with a round base (*Delosseria*, *Ceramium*, &c.) ; or oblong bodies, which are cut across into four distinct spores (*Hypnea*, *Catenella*, &c.) ; or, finally, oblong bodies, which divide vertically and transversely, so as to form segments of cylinders, rounded at one extremity, and truncate at the other, as in *Peyssonotia*. The mode of formation, and the essential organisation of these spores, is the same in each type, whether the tetraspores project beyond the tissue, or are organised in the interior of the frond. When young, the tetraspores show no exterior membrane, but appear as a reddish spherule, the development of which may be followed



1854.

\* For the explanation of the terms invented to express these terms, see *Journal of Democracy* 20, no. 2 (sec. 17), 348.

Fig. N.1—Matured branch of *Clavaria clavata*: 2 a detached branch, with sporophores on the teliospores in situ; 3 a teliospore,  $\times 4$ , containing a single,  $\times 20$  magnification of the spore of *Clavaria clavata*, showing the bases of growth.



in the different species of *Griffithsia*. We see them enlarge for a certain space of time, and present the appearance of a rose-coloured globule; but at a more advanced period the external envelope dilates, becomes transparent, and the central body, considerably increased in size, tends to separate into four parts or distinct spores, each invested with a special envelope, and of the most brilliant carmine colour. This structure brings to mind, with some slight differences, that of pollen grains." And then M. Decaisne goes on to explain how, by a stoppage of growth, or by interior multiplication, the quaternary character of these bodies may be affected.

According to Endlicher, the maximum of this order is found in the ocean between 35° and 48° N. lat. They are entirely marine. Towards the pole and the equator they diminish in numbers, and are comparatively rare in the southern hemisphere. *Rhododermis Drummondii* covers the rocks of caves with patches of a dark blood or brick-red colour.

It is among the genera of this order that occur the seaweeds whose gelatinous qualities render them valuable as food. Many species are so used among Indian nations. Of them *Plocaria tenax*, and *candida*, are the principal; and the material out of which the swallows construct the esculent nests which are so highly valued by the Chinese, is supposed to be a sort of *Gelidium*. The British *Plocaria compressa*, and *Chondrus crispus* (or Carrageen moss), have been found to possess similar qualities; and another species of the order, on the south-west coast of New Holland, furnishes a jelly of great excellence. *Rhodomenia palmata*, the dulce of the Scots, dillesk of the Irish, and saccharine *Fucus* of the Icelanders, is consumed in considerable quantities throughout the maritime countries of the north of Europe, and in the Grecian Archipelago; *Iridæa edulis* is still occasionally used, both in Scotland and the south-west of England. *Laurencia pinnatifida*, distinguished for its pungency, and hence called Pepperdulce, is eaten in Scotland; and even now, though rarely, the old cry, "Buy dulce and tangle," may be heard in the streets of Edinburgh.

But it is not to mankind alone that such marine Algae have furnished luxuries, or resources in times of scarcity. Several species are greedily sought after by cattle, especially in the north of Europe. *Rhodomenia palmata* is so great a favourite with sheep and goats, that Bishop Gunner named it *Fucus ovinus*. One species is invaluable as a glue and varnish to the Chinese. This is the *Plocaria tenax*, the *Fucus tenax* of Turner's *Historia Furorum*. Though a small plant, the quantity annually imported at Canton from the provinces of Fokien and Tchekiang is stated by Mr. Turner to be about 27,000 lbs. It is sold at Canton for 6d. or 8d. per pound, and is used for the purposes to which we apply glue and gum-arabic. The Chinese employ it chiefly in the manufacture of lanterns, to strengthen or varnish the paper, and sometimes to thicken or give a gloss to silks or gauze. It seems probable that this is the principal ingredient in the celebrated gummy matter called Chin-chon, or Hai-tsai, in China and Japan. Windows made merely of slips of Bamboo, crossed diagonally, have frequently their lozenge-shaped interstices wholly filled with the transparent gluten of the Hai-tsai. On the southern and western coasts of Ireland, our own *Chondrus crispus* is converted into size, for the use of house-painters.

In medicine we are not altogether unindebted to Rosetangles. The *Plocaria Helminthochorton*, or Corsican Moss, as it is frequently called, is a native of the Mediterranean, and had once a considerable reputation as a vermifuge. To *Hypnea musciformis* similar qualities are ascribed in the Greek Archipelago. Several species furnish Iodine, which gives them an odour of violets. *Rytiphloea tinctoria* yields a red dyeing matter, the *Fucus* of the ancients. The *Plocaria candida*, or *Fucus amylaceus*, has been found to consist of pectine, gum, and starch, with a pretty considerable quantity of inorganic matter, especially sulphate of lime. (*Ch. Gaz.* 1843, 638.) The Tsan-tjan or Kanten (called *Fucus cartilagenosus*), used in China as a substitute for the edible birds'-nests, seems to have a similar composition.

#### GENERA.

Suborder I. — <i>Ceramiceæ</i> . Frond tubular, jointed. Favellæ containing a loose mass of semi-transparent granules in a gelatinous envelope. Tetraspores external.	<i>Spyridia</i> , Harv. <i>Bindera</i> , J. Agh. <i>Ceranium</i> , Adams. <i>Boryna</i> , Gratel. <i>Dictyderma</i> , Bonnem. <i>Ptilota</i> , Agh. <i>Plumaria</i> , Stackh. <i>Microcladia</i> , Grev. <i>Haplodeigma</i> , Mont.	tinous envelope. Tetraspores globose or oblong, formed out of cells of the circumference. <i>a) Gloiocladiidæ</i> . <i>Crouania</i> , J. Agh. <i>Dudresnaya</i> , Bonnem. <i>Naccaria</i> , Endl. <i>Chætospora</i> , Agh. <i>Capillaria</i> , Stackh. <i>Gloiocladia</i> , J. Agh. <i>Gloiopeltis</i> , J. Agh. <i>Nemalion</i> , Targ.	<i>Helminthora</i> , Fries. <i>b) Nemastomidæ</i> . <i>Catenella</i> , Grev. <i>Endocladia</i> , J. Agh. <i>Iridæa</i> , Bory. <i>Nemastoma</i> , J. Agh. <i>Dilsea</i> , Stackh. <i>c) Spongiocarpidæ</i> . <i>Furellaria</i> , Lamx. <i>Fastigiaria</i> , Stackh. <i>Polyides</i> , Agh. <i>Spongiocarpus</i> , Grev. <i>Rhododermis</i> , Harv. <i>Thuretia</i> , Dec.
<i>Callithamnion</i> , Lyngb. <i>Ballia</i> , Harvey. <i>Griffithsia</i> , Agh. <i>Plumaria</i> , Lk. <i>Polychroa</i> , Bonnem. <i>Wrangelia</i> , Agh.	Suborder II. — <i>Cryptone-meeæ</i> . Frond cellular. Favellidæ containing a firm mass of compact granules within a gela-		



*Peyssonellia*, *De.*  
*Sponumaria*, *Zanard.*  
*Pterocarpus*, *Long.*  
*Phyllophora*, *Grev.*  
*Pseudofora*, *Stackh.*  
*Mentaculifolia*, *Stackh.*  
*Stelodermaria*, *Harc.*  
*Cladrius*, *Grev.*  
*Palmophora*, *Stackh.*  
*Gymnocarpus*, *Mart.*  
*Pheldia*, *Fries.*  
*Dasyphlea*, *Mont.*  
*a* *Gasterocarpidae.*  
*Dumontia*, *Lamx.*  
*Halymentia*, *Agh.*  
*Kalymenia*, *Agh.*  
*Costantinea*, *Postels.*  
*Cinaunia*, *Mont.*  
*a* *Cocceocarpidae.*  
*Cryptonemia*, *J. Agh.*  
*Codium*, *Lema.*  
*Subria*, *J. Agh.*  
*Gmatscupia*, *Agh.*  
*Phoracia*, *Raf.*  
*Giaetina*, *Lema.*  
*Marmoclesia*, *Stack.*  
*Chrysomenia*, *J. Agh.*  
*f* *Ctenodontida*, *Mont.*  
*Ctenodus*, *Kütz.*  
*Nothogenia*, *Mont.*  
 Suborder III.—*Lomentaria*.  
 Frond cellular.  
 Ceramidia having pear-shaped granules at the base of a cup-shaped envelope, which finally bursts by a pore.  
 Tetraspores scattered within the branches.  
*Lomentaria*, *Lema.*  
*Ctenocera*, *Grev.*  
*Gastrockium*, *Grev.*

*Kalifornia*, Stackh.  
*S. idea*, Stackh.  
*Champia*, Agh.  
*Mercurialis*, Roth.  
*Laminaria*, Lamour.  
*Codium*, Stackh.  
*Osmundia*, Stackh.  
*Asparagopsis*, Mont.  
*Lactuca*, J. Agh.  
*Bonnemaisonia*, Agh.  
*Capillaria*, Stackh.  
*Codium*, Gray.  
*Bonnem.*, Gray.  
*Thysanocladia*, Endl.  
*Diluvium*, Lamour.  
*Mougea*, J. A. & L.  
*Leptocarpus*, Mont.  
 Suborder IV. *Rhodoglossum*.  
*Phaeo*, Front. jointed.  
*Ceramidia* as *Leptoc.*  
 Tetraspores enclosed in  
 transformed branches  
 or Stichidia.  
*Dasya*, Agh.  
*Stichodia* pax, Agh.  
*Rhodomena*, Martius.  
*Asparagopsis*, Gray.  
*Codium*, J. A. & L., Bonnem.  
*Ellisius*, Gray.  
*Codium*, Bonnem.  
*Bonnemaisonia*, Gris.  
*Polyssionia*, Gray.  
*Boeckingeria*, Agh.  
*Gomontia*, Bonnem.  
*Ceramidia*, Mart.  
*Verdure*, Gray.  
*Dicarpella*, Bory.  
*Bonnemaisonia*, Bory.  
*Codium*, Bory.  
 Not in *Stichodia*, Mont.  
*Alisium*, Agh.  
*Agardhiella*, Stackh.  
*Bostruchia*, Mont.

*Heliotropium*, K. 12.  
Dioscor. Agh.  
Rb. 1844, 12.  
Rusc. 1847, 12.  
Acanthophora, Lamour.  
Palm. 1848, 12.  
Dietyomenia, Grev.  
Lamour. 1848, 12.  
Spathulifera, Dec.  
Cory. 1848, 12.  
R. 1848, 12.  
Odonthalia, Lyngb.  
Fimbriaria, Stackh.  
Rytiphloea, Agh.  
Polyz. 1848, 12.  
Lecanella, Dec.  
Anat. 1848, 12.  
Heterocladia, Dec.  
\*Corallineae.  
Corallina, Tournef.  
Ternstroemia, Naud.  
Jania, Lamour.  
Laliptilon, Dec.  
Amphiroa, Lamour.  
Aphrodisia, Dec.  
Eurytion, Dec.  
Chlorosporum, Dec.  
Mel. 1848, 12.  
Anaphora, Mout.  
Lithophyllum, Philip.  
Spathulifera, K. 12.  
Anaphora, Lamour.  
\*\*Anomalophylleae.  
Dietyurus, Lamour.  
Lithophyllum, Grev.  
Hemipetia, K. 12.  
Martensia, Her.  
Claudea, Lamour.  
Lamour. 1848, 12.  
Cory. 1848, 12.  
? Traumastia, Agh.  
Sunder. V. — Scellula  
Sunder. V. — Scellula

*Hypon. Long.*  
*Plocaria, A. Ag.*  
*Geothlypis, Griseb.*  
*Hydrocotyle, L.*  
*Rhodesiola, Griseb.*  
*P. ... Stach.*  
*Bifida, Stach.*  
*Chloroph. Stach.*  
*Hortonia, J. Ag.*  
*Sphaerocarpus, Griseb.*  
*Cotyledon, Stach.*  
 Suborder VI. — *Dr...*  
*Coccidiæ, ...*  
*Tetrastichus, ...*  
*Leptus, ...*  
*Sporophylls.*  
*P. ...*  
*Acrostichum, Stach.*  
*Tetrastichus, Ag.*  
*A. ... phyllum, Mont.*  
*Nitophyllum, Griseb.*  
*P. ...*  
*Hymenocarpus, Bory.*  
*Hymenocarpus, ...*  
*Hymenocarpus, Griseb.*  
*Delonixia, ...*  
*Hymenocarpus, Stach.*  
*... phyllum, ...*  
*Solleria, J. Ag.*  
*Acrostichum, ...*  
 ? *Hydroponia, Mont.*

NUMBERS. GEN. 88. Sp. 682. (Endl.)

POSITION.—Furnace. CERAMIC.—Chromite.

Rhodospirillum. *Harvey & British Marine Algae*, p. 3.

### ADDITIONAL GENERA

*Hanowia*, *Sord.*  
*Ptilocladia*, *Id.*  
*Dasyphila*, *Id.*  
*C. ...*  
*Mycoloma*, *Rehm*  
*Rhizoboloma*, *Id.*  
*D. ...*  
*Cladogonia*, *Ham.*  
*Attractophora*, *Clav.*  
*Gelmeria*, *Sord.*  
*Apothelia*, *Ham.*

*Bostrychia*, *M.*  
*Trigenaea*, *Id.*  
*Dicranema*, *Id.*



## ORDER V. CHARACEÆ.—CHARAS.

CHARACEÆ, *Rich in Humb. et Bonpl. N. G. Pl.* 1, 45. (1815); *A. Brong. in Dict. Class.* 3. 474. (1823); *Grev. Fl. Edin.* xvii. (1824); *Endlich. Gen.* iv.; *Schnitzl. ic.*—CHAREÆ, Kützinger, *Phycologia*, p. 313.

DIAGNOSIS.—*Tabular symmetrically branched bodies, multiplied by spiral-coated nucules, filled with starch.*

Water plants composed of an axis, consisting of parallel tubes, which are either transparent or encrusted with carbonate of lime, and of regular whorls of symmetrical tubular branches. Organs of reproduction, lateral, round, succulent, brick-red globules, and axillary nucules. The globules, consisting of triangular valves, enclosing centripetal tubes and slender annular threads; the nucules having two coats, of which the external is transparent and usually surmounted by five teeth; the internal firm, spirally-ribbed, filled with starch granules of various sizes.

The genera of which this little order is composed are among the most obscure of the vegetable kingdom, in regard to the nature of their reproductive organs; and accordingly we find them, under the common name of Chara, placed by Linnæus among Cryptogamous plants near Lichens; then referred by the same author to Phanogamous plants, in Monœcia Monandria; retained by Jussieu and De Candolle among Naiads, by Brown at the end of Hydrocharaceæ, and by Lemn in Haloragææ; referred to Confervas by Von Martius, Agardh, and Walther; and finally admitted as a distinct order, upon the proposition of Richard, by Kunth, De Candolle, Adolphe Brongniart, Greville, Hooker, and others. Such being the uncertainty about the place of these plants, it will be useful to give a rather detailed account of their structure, in which I avail myself chiefly of Ad. Brongniart's remarks in the place above referred to, and of Agardh's observations in the *Ann. des Sciences*, 4. 61.

Charas are aquatic plants, found in stagnant fresh or salt water; always submersed, giving out a fetid odour, and having a dull greenish colour. Their stems are regularly branched, brittle, and surrounded here and there by whorls of smaller branches. In Nitella the stem consists of a single transparent tube with transverse partitions; Agardh remarks that it is so like the tubes of some Algae, as to offer a strong proof of the affinity of the orders. In Chara, properly so called, there is, in addition to this tube, many other external ones, much smaller, which only cease to cover the central tube towards the extremities. In the axils of the uppermost whorls of these branchlets the organs of reproduction take their origin; they are of two kinds, one called the nucule, the other the globule; the former has been supposed to be the pistil, the latter the anther.

The nucule is described by Greville as being "sessile, oval, solitary, spirally striated, having a membranous covering, and the summit indistinctly cleft into five segments; the interior is filled with minute sporules. *Fl. Edin.* xvii. This is the general opinion entertained of its structure. But Brongniart describes it thus:—Capsule unilocular, monospermous; pericarp composed of two envelopes: the outer membranous, transparent, very thin, terminated at the upper end by five spreading



Fig. XII.

Fig. XII.—1 *Chara vulgaris*; 2 a portion of a branch with a nucule and globule; 3 the globule more magnified; 4 the spiral tubes of the latter; 5 a nucule cut open; 6 a nucule in germination.



tooth; the inner hard, dry, opaque, formed of two narrow valves, round apically. *Bot. Char.* &c. The fronds bear spores of the nucule, sometimes, but more commonly, only upon the experiments of Vaucher, at Geneva, who ascertained that if spores of *Chara*, which have fallen naturally in the autumn, are kept through the summer in water, they will germinate about the end of April; at that time a little brown protuberance from the upper end between the five valves, and gradually gives birth to one shoot of branches, which produces a second. Below these shoots the first roots, and little tufts of roots are emitted. The nucule adheres for a long time to the base of the stem, even when the latter has itself begun to fructify. Hence it is reasonable to conclude that the nucule is really one-seeded. Though not certain, that it is true, when a broad nucule of *Chara* is cut across, an infinite number of little white grains are exposed; and, but if these were really all reproductive particles, how would they exist free from any out of the nucule, which is indurated? he considers them rather of the nature of albumen. And he is the more confirmed in his opinion, because in *Pilularia*, the fronds of which also contain many smaller grains, but one plant is produced by each frond. These grains have been ascertained by the observations of Kützing to be really starch, iodine colouring them violet; yet Endlicher describes them as spirally striated spores. Finally, Amici has described (*Ann. des Sc.* 2.) the nucule in another way. He admits it to be one-seeded, but he considers the points of the five valves to be sagittate, and the valves themselves to be at once pericarp and style. These observations seem to show that the five valves of the nucule, as they are called, are a whorl of leaves, straight at first, and twisted afterwards; and that the nucule itself is analogous to the bud of flowering plants.

The globule is described by Greville as "a minute, round body, of a reddish colour, composed externally of a number of triangular (always?) scales, which separate and produce its dehiscence. The interior is filled with a mass of chaotic transversely undulated filaments. The scales are composed of radiating hollow tubes, partly filled with minute coloured spherules, which freely escape from the tubes when injured." Vaucher describes them as "tubercles formed externally of a reddish and transparent membrane, containing, in the midst of a mucilaginous fluid, certain white articulated transparent filaments, and some other cylindrical bodies, closed at one end, and appearing to open at the other. These latter are filled with the red matter to which the tubercles owe their colour, and which disappears readily and long before the maturity of the nucule." The account of the globule by Agardh is at variance with both these. "Their surface," he remarks, "is hyaline, or colourless; under this membrane is observed a red and reticulated or cellular globe, which has not, however, always such an appearance; often, instead of this reticulated aspect, the globe is colourless, but marked by rosettes or stars, the rays of which are red or lavender." In the figures given by authors, one finds sometimes one of these forms, sometimes the other. I have myself found them both on the same species; and I am disposed to believe that the last state is the true kernel of the globule, concealed under the reticulated scale. (When the globule is very ripe, one may often succeed, by means of a slight degree of pressure, in separating it into several valves, as is very well shown in Wallroth's figures, tab. 2. f. 3. and tab. 5. These valves are rayed, and no doubt answer to the stars, of which mention has been made.) The kernel contains some very singular filaments; they are simple (I once thought I saw them forked), curved and interlaced, transparent and colourless, with transverse striae, parallel and closely packed, as in an *Oscillatoria* or *Nostoc*; but what is very remarkable, they are attached, several together, to a particular organ formed like a bell, which is itself also colourless, but filled with a red pigment. This bell, to the base of which on the outside they are fixed, differs a little in form in different species. It is slender and long in *Chara vulgaris*, thicker in *C. firma*, shorter in *C. delicatula*, and shorter still in *C. nutans*. I have not succeeded in determining the exact position of these bells in the kernel. I have often thought they were the same thing as the rays of the rosettes or stars upon the globule above mentioned; whence it would follow that they are placed near the surface, while the filaments have a direction towards the centre. The filaments are numerous; they often separate from the filaments, and readily join with them, which renders it difficult to observe them, and has caused them to be overlooked. That these globules, whatever their nature may be, have no resemblance, in manner to authors, is clear from these descriptions, whichever may be originally adopted. Nevertheless Fritsche, the patient investigator of pollen, regards them as anthers. Wallroth says he has sown them, and that they have germinated. But this observation requires to be verified.

In the annular or chambered threads of *Chara* are found in abundance little spiral bodies having an active motion when discharged into water, and resembling exactly the so-called animalcules in masses, &c. M. Planchet, who finds *totipedia* in the spores of *Conferva aserifera* a similar moving apparatus to these bells, adding that they are turned



brown by iodine and not dissolved by ammonia as animalcules are. (*Ann. Sc. N. 2 ser.* 14, 65.) They are probably analogous to the elastic spires of *Equisetum*.

There are two other points deserving of attention in *Charas*; 1st, the calcareous incrustation of some species; and 2dly, the visible and rapid motion of the sap in the articulation of the stem.

Of the genera, *Nitella* is transparent and free from all foreign matter; but *Chara* contains, on the outside of its central tube, a thick layer of calcareous matter, which renders it opaque. This incrustation appears, from the observations of Greville (*Fl. Edin.* 281), not to be a deposit upon the outside, and of an adventitious nature, but a result of some peculiar economy in the plant itself; and according to Brewster, it is analogous to the siliceous deposit in *Equisetum*, exhibiting similar phenomena.

Whatever is known of the motions of the fluids of vegetables has been necessarily a matter of inference, rather than the result of direct observation; for who could ever actually see the sap of plants move in the vessels destined to its conveyance? It is true that it was known to botanists that a certain Abbé Corti, of Lucca, had, in 1774, published some remarkable observations upon the circulation of fluid in some aquatic plants, and that the accuracy of this statement had been confirmed by Treviranus so long ago as 1817; but the fact does not seem to have attracted general attention until the publication, by Amici, the celebrated professor at Modena, of a memoir in the 18th volume of the *Transactions of the Italian Society*, which was succeeded by another in the 19th. From all these observers it appears, that if the stems of any transparent species of *Chara*, or of any opaque one, the incrustation of which is removed, are examined with a good microscope, a distinct current will be seen to take place in every tube of which the plant is composed, setting from the base to the apex of the tubes, and returning at the rate, in *Chara vulgaris*, of about two lines per minute (*v. Ann. des Sc.* 2. 51. line 9); and according to Treviranus this play is at any time destroyed by the application of a few drops of spirit, by pressure, or by any laceration of the tube. Such is the nature of the singular phenomena that are to be seen in *Charas*. Those who are anxious to become acquainted with the details of Amici's observations will find his first paper translated in the *Annales de Chimie*, 13. 384, and his second in the *Ann. des Sc.* 2. 41; that of Treviranus is to be found in the latter work, 10. 22. The observations made upon



Fig. XII.\*

*Chara* circulation by the foregoing authors have been much extended by the careful inquiries of Solley, Slack, and Varley, whose remarks are to be found in the *Transactions of the Society of Arts*, vol. 49, p. 177, and vol. 50, p. 171; and by Donné, Dutrochet, and others, in the *Ann. Sc. Nat.* 2 ser. vol. 9, pp. 5, 65, 80, and 10, p. 346. As however they relate to physiological and not to systematical questions I forbear to dwell upon them in this place.

The creation of plants of this order would appear to have been of a very recent date, compared with that of Ferns and Palms, or even Algals, if we are to judge by their fossil remains, called *Gyrogonites*, which are found for the first time in the lower fresh-water formation, along with numerous Dicotyledonous plants resembling those of our own æra. In the recent Flora of the world they make their appearance everywhere in stagnant waters, in Europe, Asia, and Africa, in North and South America, in New Holland, and in either India. They are most common in temperate countries.

We can scarcely claim any knowledge of their uses. Their stems, often encrusted with lime in the state of carbonate according to some, and of the phosphate according to others, are probably useful as a manure. The fetid effluvia arising from them is regarded as very unhealthy, and one of the sources of the malaria of the Campagna of Rome.

#### GENERA.

*Chara*, L.

*Nitella*, Ag.

*Charopsis*, Kütz.

NUMBERS. GEN. 3. Sp. 35.

*Fluviales.*

POSITION.—*Ceramiaceæ.* CHARACEÆ. ———

*Equisetaceæ.*



*Material in Alcohol.* No. 17, 254, and 266. *Material in Alcohol.* No. 17, 254, and 266. *Material in Alcohol.* No. 17, 254, and 266. *Material in Alcohol.* No. 17, 254, and 266.

The following is M. Thuret's account of the structure of these fruits (*Archiv. Bot.* 54). The antheridia of *Chara fragilis*, *Chara*, and *Isopleura* are identical in structure. They appear as the firm, orange-red globules immediately below the sporocarpium. Though lobules consist of eight valves, so slightly convex, triangular or obly, rounded at the apex, the areoles dovetailing together so as to form a square when united. Each areole corresponds with a partition which is directed towards the centre of the valve but which stops at about a third of its breadth. That part of the lining of the valves which is turned towards the centre of the antheridium is shaded with a layer of red granules; the rest of the cell contains nothing more than a colourless liquid, and it is the thickness of this transparent part which causes the antheridium to appear as if surrounded by a whitish ring.

Upon the centre of each valve an oblong vesicle is fixed perpendicularly, filled with orange granules arranged in lines, and presenting an instance of remarkable circulation (See *Ann. des S. Nat.* 2, ser. 3, 14, p. 63, 1846). The eight vesicles converging

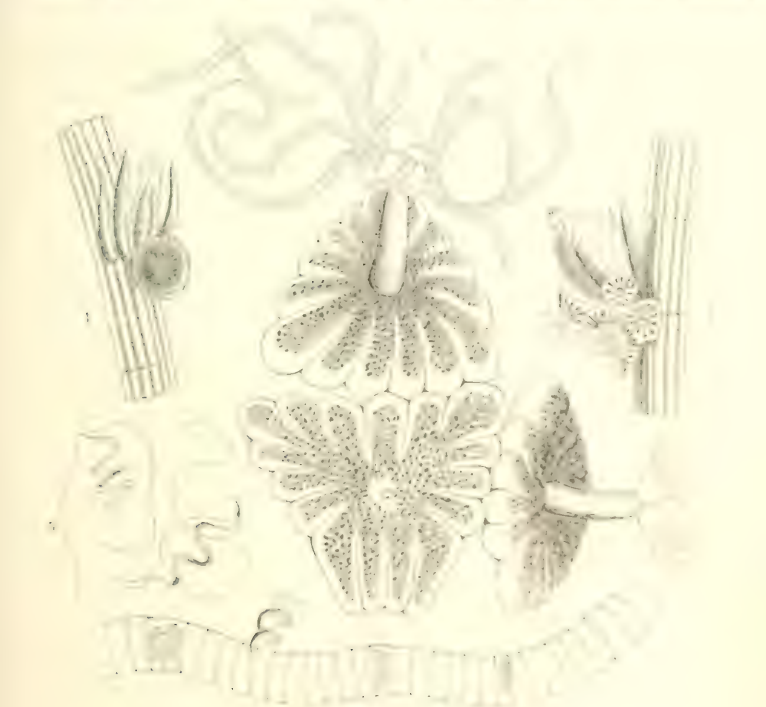


Fig. XII.

from the eight valves converge in the centre of the antheridium, where their extremities are united by means of a little cellular mass. A ninth vesicle, of the same nature as the others, but larger, and shaped like a bottle, takes the upward to the plant. Its broad base is planted in a branch of the *Chara*, while its opposite extremity, it penetrates the four lower valves, followed on for the purpose, until it reaches the cellular mass which forms the centre of the antheridium. From this point proceeds a great number of waxy transparent tubes, usually divided by partitions, at each

Fig. XII. 1. Antheridium and surrounding of *CHARA FRAGILIS* (see lower magnified); 2. the necessary later period after the dehiscence of the antheridium; 3. portion of the valves showing the whitish granules at the centre of each valve; 4. an empty fruit, in which is not antheridium; 5. Antheridium after Thuret.



joint of which is born a thread-like antherozoid, rolled up several times upon itself. When these tubes are young their joints contain only a small granular mass—a sort of nucleus—of an oval form and greyish colour; at the base of the tubes the nuclei are less regular in form; they have also a higher refractive power, and their edges are better defined. At a later period the nuclei disappear, and on each side of the joint a brilliant point arises, encircled with black, the first indication of the appearance of an antherozoid, and produced by the circumvolution of their thread-like body. By degrees these brilliant points become more numerous; the outline of the antherozoids becomes more distinct, and the numerous transverse lines which they form on the walls of the tube render it impossible to distinguish the partitions. The formation of antherozoids appears to begin always at the upper end of the tubes. By degrees the antherid dehisces; the valves turn back on the branch of the Chara, dragging with them the oblong vesicle fixed to their centre; to the extremity of the vesicle adheres a portion of the cellular mass, on which are seated the tubes filled with antherozoids: strange is the appearance then observed with the microscope. The antherozoids are seen twisting and turning all ways in the cavities which enclose them. Eventually they escape by a sudden movement resembling the action of a spring. When free the antherozoid resembles a thread twisted like a corkscrew, with three or four turns, exactly like fragments of spiral vessels. The field of the microscope is quickly covered by these little thread-like bodies, swimming with a singular tremulous motion. They turn upon their axis, always preserving the screw form, for their spire seems to have some stiffness, and their motions are caused by the continual agitation of two very long ciliæ, of excessive fineness, which spring from a little behind the anterior extremity of the spire on which they seem to fold themselves. The posterior extremity, that is to say, the one which is dragged along by the progression of the antherozoid, is rather granular, thicker, and less neatly defined than the rest of the body. When the activity of the ciliæ diminishes, it is easy to see the motion originate at their base and extend by waves in the direction of their length. Iodine, alcohol, ammonia and acids stop their movements. The ciliæ resist the action of ammonia longer than the rest of the antherozoid.

M. Thuret considers the antherozoids of Charas to be unquestionably of the same nature as those of mosses, and he believes that their function is that of impregnation, especially since the spore-cases appear to be constructed for that purpose; for the latter are surmounted by five cells, which form a kind of stigmatic coronet, and when the spore-case is young the cells surround a small canal which, at a later period, disappears, as soon as the reproductive body has arrived at a certain stage of growth.



ALLIANCE II. *FUNGAL*.—THE FUNGAL ALLIANCE.\*

Fungi. *Juss. Gen.* 3, 1789; *DC. Fl. Fr.* 2, 65, (1814); *Nees das System der Pilze nach Schumacher*, 1817; *Pries Syst. Mycol.* (1821); *Syst. Orb. Vag.* 1826; *Link. Fung.* 1828; *Ag. Fung. Fructif.* in *Dict. Class.* 3, 135, 1824; *Griseb. Syst. Crypt. Fl. G.* (1828); *H. voss. Icones Fung.* 457, 1830; *Berk. in Ed. vol. 2, pt. 2, 1831; Montagne in Hist. de Crypt. Bot. pt. 2, vol. 1, 1838, 1841, translated, with Notes, in Ann. of Nat. Hist. vol. 2, p. 1, 1842; Grev. Fung. Fructif.* (1842); *Epiphyta, Link. Gen. Pl. Eur.* xxv, 1824; *G. voss. Fung. Fructif.* 1838; *Myodes. Sp. Nat.* 4, 376, 1827; *Uredinora, Mucedinea, and Lycoperdacea, Ag. Fructif.* in *Dict. Class. L. c.* (1824); *Hyssacea, in part, Fr. Syst. Orb. Vag.* 1826.

DIAGNOSIS.—Cellular flowerless plants, nourished through their thallus (system or mycelium); living in air; propagated by spores colourless or brown, and sometimes inclosed in asci; destitute of green gonidia.



Fig. XIII.

Plants consisting of a congeries of cellules or filaments, or both variously combined, increasing in size in the more perfect species by addition to their inside, their outside undergoing no change after its first formation, chiefly growing upon decayed organic substances, or soil arising from their decomposition, frequently ephemeral, and variously coloured, never accompanied as in Lichens by reproductive germs of a vegetable green called gonidia; nourished by juices derived from the matrix. Fructification either spores attached externally, and often in definite numbers, to the cellular tissue, and frequently on peculiar cells called sporophores or basidia, which are in many cases surmounted by fine processes which immediately support the spores, and called spicules or sterigmata; or inclosed in membranous sacs or asci, and then termed sporidia. Vessels of the latex have been observed in *Agaricus foetens*, by Corda. Spinal filaments, like the claters of *Jungermannia*, exist in *Frichia* and *Batarrea*. They were first detected by the younger Hedwig, and described afterwards by Kunze and Corda. Mr. Berkeley detected them in the latter genus, and has very recently observed them, but very sparingly in *Podaxon*. The spores of fungi germinate either by a simple change

\* It is impossible to look at the huge mass of genera collected by Botanists under the name of Fungi, without perceiving that they in truth consist of groups equivalent to those called Natural Orders in the Algal Alliance, as well as in other parts of this arrangement. And if I had even an opportunity with the subject as would justify my doing so, I should have resumed to look up the characters of this Alliance into similar orders. It would, however, be presuming too far, with whose long lists must be a special study, to disturb the arrangements of those learned men who have made this their business of their lives.

The following admirable account of the Alliance has been most kindly prepared by the late Mr. J. Berkeley, whose knowledge of the species is unequalled in this or any other country. The permission permits me to state, that in his opinion the divisions here named others may be regarded as Natural Orders, in the sense in which that term is applied to Algae.

Fig. XIII.—1. *Arcyria flava*; 2. *Gaeastrum multifidum*; 3. *Mucedinea*; 4. *Hyssacea* of an *Agaricus*; 5. *Agaricus cepes*; 6. *Vermicularia trichella*; 7. Vertical section of *Hyssacea trichellaria*; 8. *Angioidium sinuosum*. From Greville's Cryptogamic Flora, with the exception of No. 4.



tion of the episporium, or by the protusion of the inner membrane which exists in most cases, and is easily separated from the outer in the asci of many species of *Sphaeria*. Fungals absorb oxygen and exhale carbonic acid. They abound in nitrogen.

Fungals are distinguished from Lichens by their more fugitive nature, their more succulent texture, their want of a thallus or expansion independent of the part that bears the reproductive matter, but more especially, as Fries has pointed out in his *Lichenographia Europæa*, in their never containing germs distinct from the fructifying bodies of a vegetable green so constant in Lichens. Many species indeed of *Sphaeria* accord very closely in their mode of fructification, producing like the Lichens distinct nuclei in the centre of their substance, which at length burst through the cortical layer, though the fructifying disc is not exposed. In the Phacidieci, however, the cups sometimes approach very nearly to the shield of Lichens; so nearly, indeed, that they are occasionally mistaken for one another.

From Algae there is, as regards structure, scarcely any palpable difference; but the most obvious distinction between Fungals and the two great divisions just mentioned consists in their mode of growth. Lichens and Algae do not derive nutriment from the substance on which they grow, but from the medium in which they are generated. Both are produced occasionally on the hardest substances, from which it is impossible that

they should derive much nutriment.\*

Fungals, on the contrary, live by imbibing juices impregnated with the peculiar principles of their matrix. It is true that many species of moulds will vegetate in liquids without any peculiar point of attachment, but these in general are in a very anomalous condition, and are in consequence often referred to Algae; but as soon as they begin to revert to their true characters, there is a distinction between the free and submerged portion, the former being supported by the juices imbibed by the latter. A few species indeed of Fungals may almost be called aquatic, such as *Cantharellus lobatus*, *Agaricus epichysium*, *Peziza clavus*, *Vibrissa truncorum*, *Leotia uliginosa*; but in most of such cases it will be observed, that it is not the habit of the whole genus but merely exceptional; and in all there is an attachment to a matrix, from which it is highly probable that a portion at least of their nutriment is derived, especially in an

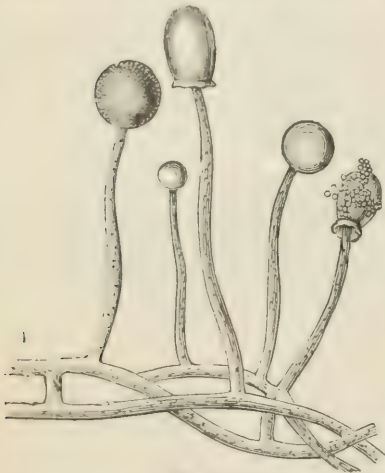


Fig. XII.

early stage of growth. In fact, these cases having been stated by way of anticipating objections, it is rather the medium in which Fungals and Algae are developed that distinguishes them, than any peculiarity in their own organisation. While there is so near an approximation of these families to each other, particularly in the simplest forms, it is important to remark that, "with a single exception," perhaps, no spontaneous motion has been observed in Fungals, which, therefore, cannot be considered so closely allied to the Animal Kingdom as Algae, notwithstanding the presence of nitrogen in them, and the near resemblance of the substance by chemists called Fungine, to animal matter. Molecular motion, indeed, takes place in the particles which give consistence to the milk of the lactescent *Agarics*, but this is very different from that which has been so repeatedly observed in Algae, and which is produced in many instances by minute cilia which invest the reproductive bodies exactly as in the Animal Kingdom. Spontaneous motion has, however, been observed in *Achlya prolifera*, which is possibly a species of *Mucor* developed in water; *Linn.* 1843, p. 129.

Fungals are almost universally found growing upon decayed animal or vegetable substances, and scarcely ever, except in the lower groups, upon living bodies of either

\* It is, however, to be remembered, that observation has shown that Lichens corrode the hard bodies on which they grow, from which it is, perhaps, to be inferred, that they do to a certain extent really feed upon them.



Kingdom; in which respect they differ from *Lechea*, which very commonly grows upon



Fig. XIII.



Fig. XIV.

the living bark of trees. The more simply organised species are not confined to dead or putrid substances, as is shown by their attacking various plants when in a state of perfect life and vigour: but it has been incontestably proved by the discoveries of *Lechea* and *Cordia*, that the extensive tribe of Epiphyllous Fungi really belong to this division, and are not mere anamorphoses of the cellular tissue, as is the case with some productions usually referred to Fungi, as *Erineum*, *Tapetaria*, &c.\* Many observations, also, have been made of late years on the development of Fungi on living animal tissues. Of this

\* It is not merely alterations of the epidermis of plants which assume the appearance of Fungi; but also, on tubercles caused by the attacks of insects, bear externally a wonderful resemblance to real

fungi; so much so indeed, that they have been mistaken for them even by good botanists on a hasty and superficial inspection. For here, as in other branches of the creation, we observe somewhat of that wonderful analogy by which, in each distinct class or even division of natural production, the same, or extremely similar forms are repeated, though accompanied by an organisation totally different; and it is this amongst other circumstances which render it so absolutely necessary to examine into the internal structure of the works of this creation, before venturing to place them upon their proper place in the system. Several of these galls have been framed by Mr. Curtis in his interesting entomological articles in the "Gardener's Chronicle;" such, for example, as Oak-spangles, produced by *Diplolepis lenticularis*; Oak currants, by *Cynips quercus-pedunculæ*; Wood-vetch galls, which owe their origin to the puncture of *Cynips Quercus ramuli*; Elm-galls, brought on by the attacks of the *Aphis*: in the case of galls, however, it is but a superficial examination which can possibly deceive, for



Fig. XV.

Fig. XIII.—*Erineum Jodanaleis*.

Fig. XIV.—*Thecium luteopunctatum* (galls).

Fig. XV.—Oak Spangles. 1. Upper side. 2. under side. 2. and 3. the galls from a section of oak with a larva in the interior. See Curtis in *Gardener's Chronicle*, 1840, p. 32.



nature are the *Guêpes végétales* of the West Indies; the Muscardine, which is so destructive to silkworms, and on which so many excellent Memoirs have been written; the mould, which so often causes the death of the common house-fly in autumn; and above all, the curious instances which have been recorded of the development of moulds in the mucous membrane of the viscera of vertebrate animals, and in certain cutaneous disorders in man.

Mouldiness, for instance, has been found by M. Deslongchamps on the internal surface of the air-cells of an Eider-duck while alive; and Mr. Owen observed a similar growth in the lungs of a Flamingo.—*Ann. Nat. Hist.* viii. 230. Col. Montagu had previously remarked it in the same situation in the Scarp-duck.—*Id.* ix. 131. Gruby observed the

even where the little grub which produced them has vanished, the total absence of all parts of fructification will at once decide the point. If, for instance, the cup-shaped gall, which is so common on Oak leaves, be the object in question, any one who has once examined the hymenium of a *Peziza*, and observed the fructifying cells arranged vertically like the pile of velvet, with their row of eight mostly elliptic sporidia, cannot for a moment be deceived. It does, however, sometimes happen that galls are extremely like Fungi; a remarkable instance of which has been figured in the Transactions of the Linnean Society. It was sent by Mr. Macleay, from Cuba, on the leaf of some plant of the Natural Order *Ochnaceæ*. In this case there is not merely an extraordinary development of the external cellular tissue, but the gall is formed within the substance of the leaf, and after a time bursts through the skin, and presents a little ovate body with a crenate border, and within this an operculum which is perforated, or at least apparently perforated in the centre, so as to present a very close resemblance to some strange para-



Fig. XVI.



Fig. XVII.

site. And, as if to make the resemblance to some Fungus more close, the gall appears to make an abortive attempt to penetrate the opposite surface of the leaf, almost exactly in the way which is observable in the curious production which is sometimes so injurious to Pear-trees. But even in this case, where there is no trace of the inclosed grub or pupa, the texture of the walls of the gall is so different from that of Fungals that it can scarcely deceive, on any moderately accurate examination.

There is yet another production, referred to Fungals by Bernhardt, and after him by Fries and others, which, however, is probably to be regarded neither as a disease nor parasite. These are the tuberos bodies so common on the roots of leguminous plants. Their exact nature and use at present is not known; but a Memoir on them has been prepared some time by M. Desmazières. They appear a very few days after the germination of the seeds, and are accompanied by a little bed of vessels, in which they are nestled. At an early stage of growth, the contents of their cells become blue, when treated by iodine, which is not the case when their pulpy contents have acquired a salmon-coloured hue, when in some cases the granules are simple and oblong, in others forked. There can be little doubt that they are of some importance to the plant, though they are not, like common tubers, destined for the reproduction of the species, as they pass through the phases of vegetation in a short time, and soon become ruptured and discharge their contents. No insect has ever been observed in them, nor indeed does it at all appear that they are of the nature of galls. It is possible that in very dry situations, and in time of drought, the nutriment collected in them is serviceable to the plant; but this is very doubtful.

Fig. XVI.—Galls on the leaf of an *Ochnaceous* plant.

Fig. XVII.—Woolly Oak-gall, produced by *Cynips Quercus ramuli*.—(Curtis.)



crusts of *Tinea favosa* and *Porizoa hyphoma* to be accompanied by moulds, (*Aspergillus* *Roch. Ann. Hist.*; and these observations have been extended by Dr. Blomberg, *Præm. Reg. Soc. Sci.*, vol. XV., Part 2, p. 277, who has also observed a mould growing on the living membrane or cheesy matter of tubercular cavities in the lungs of man; and also the development of a mould on the skin of living patients. Much more would be found on the subject in the plates already quoted.

In their simplest form Fungi are little articulated filaments, composed of simple cells placed end to end; such is the mouldiness that is found upon various substances, the middle of the Rose leaves, and in short, all the trunks of Mosses and Mushrooms; in some of these the joints disarticulate, and appear to be capable of reproduction; in others, spores collect in the terminal pores, and are finally dispersed by the rupture of the cells that contained them. In a more solid state of composition, Fungi are masses of cellular tissue of a determinate form, the whole centre of which consists of spores attached, often long together, to the cellular tissue, when at length driven by having a dust-like mass intermixed more or less with flocci, as in the pebbles, or sporidia contained in membranous tubes or sacs, and these those of *Lichens*, as in the *Sphaeria*. In their most complete state they consist of two surfaces, one of which is even and imbricated,

like the cortical layer in *Lichens*; the other separated into plates or sacs, and called the hymenium, to whose component cells, which form a stratum resembling the pile of velvet, the spores are attached by means of little processes, and generally in fairs, though occasionally the number is either less or greater. Many of these cells remain barren; but after a time there is a succession of fertile cells constantly making its appearance above the surface of the hymenium; and, what is more remarkable, the spicules or sterigmata, which support and give rise to the spores, have been observed by Corda to produce a succession of fruit, a new spore being produced where the old one had fallen. This, he informs us, is very easy of observation in *Agaricus phytas*. Besides the barren and fertile cells, other bodies are observed which have been supposed by authors to perform the office of anthers. These have long been known in the dung-hill *Agaricus*, but they appear to be pretty generally distributed. The true structure of the more perfect Fungi has only been recognised within a few years. *Charles Muller*, half a century since, gave a correct figure of it in *Agaricus cornutus*, and there are indications of it scattered through many works. *Leveillé's* *Mémoire* in *Annales des Sciences Naturelles*, that of *Berkeley* in the *Annals of Nat. History*, of *Pharacis* *Sæm. Acta Ges. Leop.*, and those of *Berkeley* and *Tulasne* in the *Ann. of Soc. Hist. and Nat. des Sc. Nat.* on the fructification of *Lycopodium*, as also that of the *Mém. Tulasne* on *Hypogæous Fungi*, may be consulted on this subject.

Upon this kind of difference of structure, Fungi have not only been divided into distinctly marked tribes, but it has been proposed to separate certain Orders from those under the name of *Byssaceæ*, *Gasteromycetæ*, and *Hypoxylæ*; the first comprehending the filamentous Fungi found in cellars, and similar plants; the second *Lycopodium* and the like; and the third species which approach *Lichens* in the formation of a distinct nucleus for the sporules, such as *Sphaeria*. But *Fries* maintains the first to be a distinct group, and the two last as Fungi.

Some writers have questioned the propriety of considering Fungi as plants, and

FIG. XXI.—*Betisys cornuta*.

FIG. XXII.—1. Spore stalk of *Agaricus cornutus*, with its four long articulations and small pores; 2. 4. spore stalks of *Ag. sem. virens*, with spores on various stalks of the hymenium; 3. petiole and opening of *Umbellula elastica*; 4. sporidium of *Trich. muscigena*, *Præm. Reg. Soc. Sci.*, vol. XV., Part 2, p. 277, fig. 1; 5. a spore of *Umbellula elastica*; 6. a spore of *Umbellula elastica*, with a large globose nucleus.



have proposed to establish them as an independent Kingdom, equally distinct from animals and vegetables; others have entertained mere fortuitous developments of vegetable matter,

doubts of their being more than called into action by special conditions of light, heat, earth, and air—doubts which have been caused by some remarkable circumstances connected with their development, the most material of which are the following: they grow with a degree of rapidity unknown in other plants, acquiring the volume of many inches in the space of a night, and are frequently meteoric, that is, spring up after storms, or only in particular states of the atmosphere. It is possible to increase particular species with certainty, by an ascertained mixture of organic and inorganic matter exposed to well-known atmospheric conditions, as is proved by the process adopted by gardeners for obtaining *Agaricus campestris*, a process so certain, that no one ever saw any other kind of *Agaricus* produced in Mushroom-beds, except a few of the dunghill tribe, where raw dung has been placed near the surface of the bed; this could not happen if the Mushroom sprang from seeds or spores floating in the air, as in that case many species would necessarily be mixed together; Fungi are often produced constantly upon the same kind of matter, and upon nothing else, such as the species that are parasitic upon leaves: all which is considered strong evidence of the production of Fungi being accidental, and not analogous to that of perfect plants. Fries, however, whose opinions must have great



Fig. XXIII.

weight in all questions relating to Fungi, argues against these notions in the following manner: "The sporules are so infinite (in a single individual of *Reticularia maxima* I have reckoned above 10,000,000), so subtile (they are scarcely visible to the naked eye, and often resemble thin smoke), so light (raised, perhaps, by evaporation into the atmosphere), and are dispersed in so many ways (by the attraction of the sun, by insects, wind, elasticity, adhesion, &c.), that it is difficult to conceive a place from which they can be excluded." I give his words as nearly as possible, because they may be considered the sum of all that has to be urged against the doctrine of equivocal generation in Fungi; but without admitting, by any means, so much force in his statement as is required to set the question at rest. In short, it is no answer to such arguments as those just adverted to. It seems to me that a preliminary examination is necessary into the existence of an exact analogy between all the plants called Fungi; a question which must be settled before any further inquiry can be properly entered upon. That a number of the fungus-like bodies found upon leaves are mere diseases of the cuticle, or of the subjacent tissue, is by no means an uncommon opinion; that many more are irregular and accidental expansions of vegetable tissue in the absence of light, is not improbable; and it is already certain that no inconsiderable number of the Fungi of botanists are actually either, as various *Rhizomorphae*, the deformed roots of flowering plants growing in cellars, clefts of rocks, and walls; or mere stains upon the surface of leaves, as *Venu-laria graminica*; or the rudiments of other Fungi, as many of Persoon's *Fibrillarias*. Those who are anxious to inquire into these and other points, are referred to Fries'

Fig. XXIII. — *Aseroe pentactina*.



works generally, to the various writings of New York Entomologists, and to the numerous Cryptogamic Papers of Griseballe. In the course of all research, I have steadily pursued myself in the writings of Fries. The illigibility, however, of his works had been remedied in conformity with recent discoveries as to the real importance of the more kindly organized species, and the numerous descriptions of Fungi, where their affinities were at all clear, have been corrected. That it must be a matter of extreme difficulty to form any precise opinion concerning Fungi, without long experience, will be apparent from the observations of Fries upon the genus *Endophoma*. (*Abhandl.* p. 120.) He asserts that out of more than 1000 specimens in imperfect states of the subgenus, the following genera, all of which he has identified by means of microscopic studies, have been distinguished; viz., *Athelia* of Persoon, *Oospora* of Persoon, *Hymenium* of Persoon, *Sporidialium* of Kunze, *Myriophorum* of Vahl, *Nyctotium* of Persoon, *Conium* of Persoon, and many others. The Fr. New York Entomologist also informs us that the same fungoid matter which produces *Sclerotium mycelotum* in the winter, develops *Agaricus vulgareus* in the summer. It would thus seem that the opinions of those who have asserted that the species or genus of a Fungus depends not upon the soil from which it springs, but upon the matter by which it is nourished, are at least specious; especially if we take the known fact in connection with the experiments of Dutrochet, who obtained different effects in Mouldiness at will, by employing different infusions. He says that certain acid fluids constantly yield *Medulla*, and that certain alkaline fluids equally produce *Bacterium*. (*Ann. de N. B.* t. 1. p. 30.) For a description of the gradual development of an *Aspergillus*, see this ingenious observer's Memoir in the *Ann. de N. B.* vol. iii. p. 76. For the views of Unger upon spurious Fungi, which he considers nothing but married medullas (conjugations) of vegetable matter, see the *Ann. de N. B.* vol. ii. s. 202, and Berkely's remarks thereon, in *Hort. Brit. Fl.* vol. ii. p. 2, p. 101.

Since, however, the remarks of Unger were published, Leveillé and Corda, almost at the same time, and quite independently of each other, made their discovery of the Mycelium of Uredines and Pucciniae, and Corda has succeeded in making many germinate. Unger's speculations, therefore, must be considered as null and invalidated, at least so far as their being mere transformations of the cellular tissue, as is the case in *Erineum*. Whether animal and vegetable bodies are ever produced without pre-existent germs, belongs to quite another question. And, as regards the genera *Oidium*, *Hymenium*, &c., they are now regarded by all good mycologists as mere barren states, or anamorphoses of other species; and the same is probably true of many of the more anomalous Fungi; and the observations of Leveillé, in the *Annales des Sciences Naturelles*, go very far to prove that the whole genus *Sclerotium* belongs to the same category. Some of them, as *Aerospermum cornutum*, and *Sclerotium mycelotum*, are undoubtedly mere forms, and have no right whatever to be considered as species; others arise from the condensation of the filamentous tufts of moulds; others, as *S. lotorine*, are little excrescences upon the roots, and the celebrated Ergot is produced by the action of a minute parasite. There is indeed a difficulty about such species as *Sclerotium scutellatum*; but there is little doubt that, in the main, Leveillé's observations, even though from the nature of the subject the proof is not rigorous, are founded in fact. Some supposed species of Uredo are merely the young of Puccinia, *Arizma*, &c.; but there are also true species of the genus. See *Hort. Brit. Fl.* vol. ii. p. 2.

Kützinger, in his *Prin. Essay on the Transformation of Plants*, asserts that from one and the same organic material, even when it has acquired form and colour, different vegetables may be developed, which, according to the circumstances of the surrounding medium, are Algae, Fungi, Lichens, or Mosses: and that even the species of these, when pro-



FIG. XXIV.

FIG. XXIV.—*Puccinia annua* (common Rust), with its spores it represents remaining attached to the plant on which it grows.



duced, are capable of generating plants belonging to different Orders. This has been long a favourite theory in Germany, but it has not been so fully developed before. *Natuurkundige Verhandelingen van de Holl. Maatsch. der Wetensch. te Haarlem. Tweede Verz. 1. Deel.*

The subject, as regards the possible development of Algals, &c., from Infusoria, has been rehandled by the same author in a Memoir just published at Nordhausen. Those who are not convinced by his reasonings, will at least be ready to acknowledge the great research and patience with which they have been followed out. His observations are entitled to the greater attention, because he is well acquainted with the various forms assumed by cellular plants, though his great work on Algals scarcely shows him to have accurate notions as to the limits of genera and species.

The Fungi by which most extra-tropical countries are inhabited are so numerous, that no one can safely form even a conjecture as to the number that actually exists. If they are ever fortuitous productions, the number must be indeterminable; if many are mere diseases, and the remainder fixed species, then the knowledge of their nature must be reduced to a more settled state before any judgment upon their number can be formed. Fries discovered no fewer than 2000 species within the compass of a square furlong in Sweden; of Agaricus alone above 1000 species are described; and of the lower tribes the number must be infinite. Sprengel, however, does not enumerate in his *Systema Vegetabilium* more than between 2700 and 2800; but when we consider that his genus Agaricus does not go beyond number 646, although 1000 at least are described, it is not improbable that the rest of his enumeration is equally defective, and that the number of described Fungi perhaps amounts to between 4000 and 5000. Of tropical species we know but little; their fugitive nature, the difficulty of preserving them, and perhaps the incuriousness of travellers, as well as their scarcity in the damp parts of equinoctial countries, have been the causes of the proportion in such climates between Fungi and other plants being unknown. Mr. Berkeley has taken occasion, from the publication of a list of Java Fungi by Junghuhn, to institute a comparison between those of Java and the Philippine collection made by Mr. Cuming. Neither list can, indeed, be considered as complete, but in both cases the proportion of Fungi remaining to be described is probably much the same. Parts of the Philippines are situated in a degree of latitude in the northern hemisphere exactly corresponding with that of Java in the southern. The number of species described by Junghuhn is 113, that collected by Cuming about 40. Of these only  $\frac{1}{2}$  of the species are common to the two localities, and out of these four are species of Polyporus common to all tropical countries. Of Junghuhn's Fungi  $3=\frac{1}{37}$  are Coniomyceetes,  $9=\frac{1}{12}$  are Hyphomyceetes,  $7=\frac{1}{18}$  Gasteromyceetes,  $13=\frac{1}{6}$  Pyrenomyceetes,  $10=\frac{1}{11}$  Discomycetes, and 66, or above  $\frac{1}{2}$ , Hymenomyceetes. In Mr. Cuming's collection there are no species of the first, second, and fifth Families; of the remaining Families  $1=\frac{1}{15}$  belongs to Gasteromyceetes,  $5=\frac{1}{5}$  are Pyrenomyceetes, and 33, or more than  $\frac{3}{4}$ , are Hymenomyceetes. It will be observed that the proportion of Pyrenomyceetes is the same, and there is even a greater proportion of Hymenomyceetes in the Philippines. Of the Hymenomyceetes in Java, 40 are Polypori; in the Philippines, 19, taking the genus in its widest sense. There is now an opportunity of contrasting with these the Fungi of Cuba, which have been so well worked out by Dr. Montagne. The species of that island, as far as at present recorded, are 115, of which  $4=\frac{1}{28}$  are Coniomyceetes,  $10=\frac{1}{11}$  Hyphomyceetes,  $9=\frac{1}{13}$  Gasteromyceetes,  $25=\frac{1}{5}$  Pyrenomyceetes,  $8=\frac{1}{14}$  Discomycetes, and  $59=\frac{1}{2}$  Hymenomyceetes. The proportion of Pyrenomyceetes is nearly the same as in Java and the Philippines, and the predominance of Hymenomyceetes is equally striking. Of this number 28, or  $\frac{1}{4}$ , are European species; whereas among the Philippine Fungi there are but 2, while in Java there are 42. Of these the greater part are very common species. With the exception of European species, 5 only are common to Cuba and Java, and 4 to Cuba and the Philippines; and these, with one exception, species universally distributed. The species which forms an exception is *Micropeltis applanata*, which, as it is a minute Epiphyllous plant, may possibly have been overlooked in other countries. The number of Fungi peculiar to Cuba is very large. Cuba, then, has but little in common with Java and the Philippines, when the cosmopolites and European species are excepted. Several species, however, are identical with those of North and South America, extending in one instance even as far as Juan Fernandez; and there are one or two isolated species which call to mind Mauritius, Ceylon, and Australia. The genus Polyporus, as usual, predominates, counting 31 species, of which 8 are European; or, if Favolus and Hexagonia be included, the number

\* It will be observed that in the list of genera given below, the Discomycetes and Pyrenomyceetes are comprised in one group under the name of Ascomycetes. The Discomycetes correspond with the three first suborders.



amounts to 45. When the climates are at all analogous, and the names of the thermometer at certain seasons similar, it is astonishing how great a resemblance, and even identity, there is between the Fungi of very distant portions of the globe. Warm America produces far the greater part of the European species, with a certain portion peculiar to itself. Hundreds of the same species of *Sphaeria* and *Aspergillus* occur in that country which are found with us. The curious genus *Mitromyces*, which is not produced in this country, has been found in Java, Van Diemen's Land, and New Holland. And it would, perhaps, be difficult to point out any specific group peculiarly characterized by the country. But the same resemblance exists, to a great extent, also in the Southern Hemisphere. In the island of Juan Fernandez, which was so carefully investigated by Forster, scarce a third of the species differ from European Fungi. The same is the case in the Flora of New Zealand and Australia, from whence I possess a large quantity of species; and though there are many new forms, and some belonging to genera not hitherto found in Europe, a large proportion of the species are identical. In the genus *Agaricus* the species in countries of every variety of climate are often identical. The African Mycology is remarkable for the varied forms it produces amongst the puff-balls and allied genera, especially in that tribe which is called *Podaxines*. They commence at the south of Europe, in the environs of Marissies; abound at the Cape of Good Hope, and form a very remarkable feature still in the Fungi of Swan River. Two species of the African genus *Scotium* occur at the Swan River; and possibly a third, and a very beautiful species, occurs in New Zealand. A species of *Podaxis* was found by Dr. Hooker at Porto Praya, identical with the East Indian species. A single imperfectly known species occurs in the warmer parts of North America. The genus *Clathrus*, which is perhaps the most beautiful amongst Fungi, though unknown in the more northern latitudes, has a most extensive geographical range. A *Clathrus*, running obliquely from the Isle of Wight through Germany, defines its northern limits: two species, one of the allied genus *Hoodietzium*, occur at the Swan River; and a magnificent species of that genus occurs in New Zealand, and is eaten by the natives. On the whole, then, it will be seen that the geographical limits of Fungi are by no means so definite as those of Phanerogamous plants. Some species are found in every part of the globe; and several tropical forms are either universally dispersed, or occur in spots separated from each other by many thousands of miles. In the genus *Erysiphus* every country seems to have species peculiar to itself; and from the number of new forms which daily occur, the genus seems to be almost co-extensive with *Agaricus*. It is in this genus, probably, if in any, that the species will be found to follow the most nearly a geographical arrangement.

A large volume might be written upon the qualities and uses of Fungi. They may be said to be important, either as food or as poison, or as parasites destructive to the plants upon which they grow. As food, the most valuable are the *Alanus emporicus*, or common Mushroom, the various species of *Helvella* or Morel, and Truffle or Truffle; but a considerable number of other kinds are used for food in various parts of the world, of which a useful account will be found in De Caudolle's excellent *Essai sur les Propriétés Médicales des Plantes*, in Persoon's work, *Sur les Champignons comestibles*, in a paper by Greville in the 4th volume of the *Transactions of the Wernerian Society*, and in Roque's *Hist. des Champ. comestibles et vénéneux*, vol. 2, 1841. A long list might be given of works on the subject, some of them like those of Vittadini, Frølich, and Kromdholz, very admirably got up.

About half a dozen species only are eaten in London, and in Paris none are permitted to appear in the markets except the common Truffle, Morel, and Mushroom, the latter being cultivated to a very considerable extent in the ancient quarries which run under parts of the city.

It is necessary to exercise the utmost care in employing Fungi, the use of which is not perfectly well ascertained, in consequence of the resemblance of poisonous and wholesome species, and the dreadful effects that have followed their incautious use. But the greatest caution and knowledge will not always avail, for it appears that some species which are in general perfectly wholesome, sometimes produce very dangerous consequences. A family at Cambridge a few years since suffered from eating mushrooms; a part of what were gathered were submitted to the benefit of the professor's remarks, and proved to be *Ag. personatus*, a species sold sometimes in the London markets, and ascertained by Mrs. Hussey, who has paid great attention to the subject, to be most excellent for food. The case perhaps is similar to those of the prejudicial effects sometimes experienced by persons after eating mussels, and may be considered as a mere exception.

It is true that many kinds are named by Pallas as being commonly used by the Russians, which are plentiful in countries where they are not employed for food; but, in the first place, it is not perhaps quite certain that poisonous and wholesome species



are not confounded under the same name; in the next place, climate may make a difference; and lastly, much depends upon the mode in which they are cooked. Upon this subject Delile observes, that it was ascertained by Paulet, in 1776, that salt and vinegar removed every deleterious principle from that most poisonous plant the *Agaricus bulbosus*; that it is the universal practice in Russia to salt the *Fungi*, and that this may be the cause of their harmlessness, just as the pickling and subsequent washing of the poisonous *Agaric* of the Olive renders it eatable in the Cevennes; but that, nevertheless, it is much wiser to run no risk with unknown *Fungi*, even taking such precautions—a remark to which he was led by the lamentable death of a French officer and his wife, in consequence of breakfasting off some poisonous *Agarics*, which were nevertheless eaten by other persons in the same house with impunity. It was probable that in that case a difference in the cooking was the cause of the difference in the effect of the *Fungi*; but it was a sufficient ground for distrusting all *Fungi* except the cultivated ones. So strongly did the late Professor L. C. Richard feel the prudence of this, that although no one was better acquainted with the distinctions of *Fungi*, he would never eat any except such as had been raised in gardens in mushroom beds. One of the most poisonous of our *Fungi* is the *Amanita muscaria*, so called from its power of killing flies when steeped in milk. Even this is eaten in Kamchatka, with no other than intoxicating effects, according to the following account by Langsdorf, as translated by Greville, from whom I borrow it:—

“This variety of *Amanita muscaria* is used by the inhabitants of the north-eastern parts of Asia in the same manner as wine, brandy, arrack, opium, &c. is by other nations. Such *Fungi* are found most plentifully about Wischna, Kamchatka, and Wilkowa Derecona, and are very abundant in some seasons, and scarce in others. They are collected in the hottest months, and hung up by a string in the air to dry; some dry of themselves on the ground, and are said to be far more narcotic than those artificially preserved. Small deep-coloured specimens, thickly covered with warts, are also said to be more powerful than those of a larger size and paler colour. The usual mode of taking the *Fungus* is, to roll it up like a bolus, and swallow it without chewing, which, the Kamchatkades say, would disorder the stomach. It is sometimes eaten fresh in soups and sauces, and then loses much of its intoxicating property; when steeped in the juice of the berries of *Vaccinium uliginosum*, its effects are those of strong wine. One large, or two small *Fungi*, are a common doze to produce a pleasant intoxication for a whole day, particularly if water be drank after it, which augments the narcotic principle. The desired effect comes on from one to two hours after taking the *Fungus*. Giddiness and drunkenness result in the same manner as from wine or spirits; cheerful emotions of the mind are first produced; the countenance becomes flushed; involuntary words and actions follow, and sometimes at last an entire loss of consciousness. It renders some remarkably active, and proves highly stimulant to muscular exertion: by too large a dose, violent spasmodic effects are produced. So very exciting to the nervous system in many individuals is this *Fungus*, that the effects are often very ludicrous. If a person under its influence wishes to step over a straw or small stick, he takes a stride or a jump sufficient to clear the trunk of a tree; a talkative person cannot keep silence or secrets; and one fond of music is perpetually singing. The most singular effect of the *Amanita* is the influence it possesses over the urine. It is said that, from time immemorial, the inhabitants have known that the *Fungus* imparts an intoxicating quality to that secretion, which continues for a considerable time after taking it. For instance, a man moderately intoxicated to-day will, by the next morning, have slept himself sober, but (as is the custom) by taking a teacup of his urine he will be more powerfully intoxicated than he was the preceding day. It is, therefore, not uncommon for confirmed drunkards to preserve their urine as a precious liquor against a scarcity of the *Fungus*. The intoxicating property of the urine is capable of being propagated; for every one who partakes of it has his urine similarly affected. Thus, with a very few *Amanitas*, a party of drunkards may keep up their debauch for a week. Dr. Langsdorf mentions, that by means of the second person taking the urine of the first, the third of the second, and so on, the intoxication may be propagated through five individuals.”

It is universally known that the common *Agaric* is cultivated with as much certainty by good gardeners as any other vegetable. The excellent *Boletus edulis* has been partially cultivated in the south of France by inclosing a portion of a wood, and watering the ground with water in which the tubes had been steeped. Borch raised *Tuber Borchii* from the sporidia about the year 1780, and the growth of the common *Truffle* has been attempted with more or less success. Mr. Drummond has sent over the spawn of a large variety of *Agaricus campestris* from the Swan River, which he says is as far superior to the common mushroom as the improved peas to the old varieties, and it has been submitted to Mr. J. Henderson, but it is feared that it is too old to run.



*Polyporus tenuiculus* has been extensively produced in Germany, and merely in placing wood in a favourable situation, and keeping it well covered. Five or six crops were obtained in the year. (*Zinn and Eder, Myc. v. p. 187.*)

A curious species which grows on the living branches of the Scotch *Atropa*, bearing and which has been described by Mr. Berkeley in the Transactions of the Linnæan Society, under the name of *Cyttaria Darwinii*, forms a principal part of the food of the natives of Tierra del Fuego, sharing many months of the year.

Fungi are much used in Australia by the natives, especially of the great Island. The large truffle *Mylitta australis*, Berk., which attains a weight of more than one pound, is known under the name of native bread. The marginal animals are particularly fond of Fungi, and some species they hunt for so greedily, observing them before they burst through the earth, that it is very difficult to obtain a well-grown specimen.

Mr. Hæschke also informs us that Fungi are much used by the natives. Species which he particularly alludes are probably *Polyporus portentosus*, Berk., a specimen of which could only be eaten in the absence of all other food, and a species of *Cyathus* hitherto unrecorded by botanists.

One or two species are used in medicine. *Sphaeria sinensis*, Berk., described in *Mémoires de Bot.*, is an excellent remedy amongst the Chinese, and is much praised by Du Halde's book, but probably without reason.

Many Fungi were admitted into the old Pharmacopæias, as *Lycella aurantia* ductis, *Polyporus officinalis*, *Tremella mesenterica*, but at present they are little if at all used.

*Lycurus mesurus* is considered by the Chinese as an excellent remedy in gonorrhœa &c. It is also eaten, but is often poisonous. The jelly-like volva of the nearly allied genus *Hoodia* is eaten in New Zealand.

Fungus of rye is well known for its specific action on the uterus, and is in consequence one of the most valuable remedies of the modern Pharmacopæia. It is, however, said to be misapplied. It is not only no less nutritious for the animal effects it produces on the human frame when it exists in considerable quantities in bread-corn, causing the most terrible plagues and epidemics, which at length destroy the human race. Similar effects have been experienced from the use of mouldy provisions. Interesting details on the subject will be found in Bonnet's *Œuvres*, and in Professor Henshaw's Report on the Disease of Wheat, in the Journal of the Royal Society of Agriculture, 1841, vol. ii. part 1. Copious details will also be found in Planché's *Précis d'histoire naturelle* &c. On the real nature of Ergot Smith and Quercett's Memoirs, *Ann. Y. xviii. p. 452, 3. and six. p. 157*, should be consulted. Corda has lately confirmed the description of

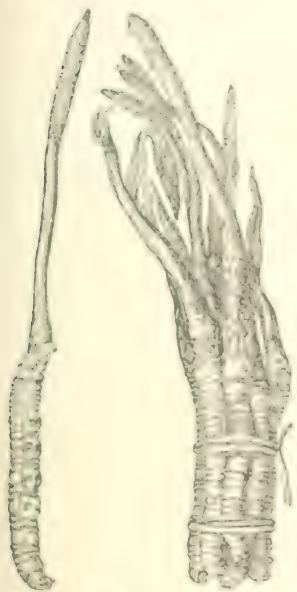


FIG. XXIV.\*

Messrs. Smith and Quercett; and more recently a Memoir on the subject has been published by Péc.

Of parasitical Fungi, the most important are those which are called *Agg. on wood*, *Polyporus destructor*, *Merulius lacrymans* and *vastator*, &c., which are the cause of wooden constructions; next to these come the blight of corn, occasioned by *Puccinia graminis*; the smut and ergot, if they are really anything more than the diseased and disorganised tissue of the plants affected; the rust, which is owing to the ravages of *Uredos* and *Puccinire*; and finally, in this class, not included what we call mildew, minute simple articulated Mucors, and *Mucorine*. The effects of different moulds on bread, preserves, &c., are but too well known. In some cases, however, as in cheese, provisions are thought to be improved by them. The decay of fruit, according to the observations of Mr. Hassall, appears to be in great measure produced by them. The genus *Rhizomorpha* (which it now is observed is a separate genus, consisting of imperfectly developed *Sphaeria*, *Polyporus*, &c.) *virginea* is dark mines far from the light of day, and is remarkable for its phosphorescent property.

\* FIG. XXIV. \*—*Sphaeria sinensis*. The right-hand figure represents the manner in which it is made up for sale.



ties. In the coal mines near Dresden the species are described as giving those places the air of an enchanted castle; the roof, walls, and pillars, are entirely covered with them, their beautiful light almost dazzling the eye. The light is found to increase with the temperature of the mines. *Ed. P. J.* xiv.

Several species of genuine Fungi have been observed to be phosphorescent in various parts of the world. *Agaricus Gardneri*, Berk., which grows on a sort of Palm called *Pintada* in Brazil is highly luminous. Such also is the case with *Agaricus olearius* in the South of Europe, as observed by Delile. (*Arch. de la Bot.* vol. ii. p. 519.) Mr. Drummond has found two or more luminous species at the Swan River, (*Hook. Lond. Journ. of Bot.* ii. p. 263 ; ) and Rumphius observed the same phenomenon in Amboyna.

It is a most remarkable circumstance, and one which deserves particular inquiry, that the growth of the minute Fungi, which constitute what is called mouldiness, is effectually prevented by any kind of perfume. It is known that books will not become mouldy in the neighbourhood of Russia leather, nor any substance, if placed within the influence of some essential oil. *Polyporus fomentarius*, or an allied species, is used in India as a styptic, as well as for Amadou. It is also employed by the Laplanders and others as Moxa. (*Ainslie*, i. 5.) The *Boleti*, when wounded, heal much in the same manner as the flesh of animals. (*Edin.*

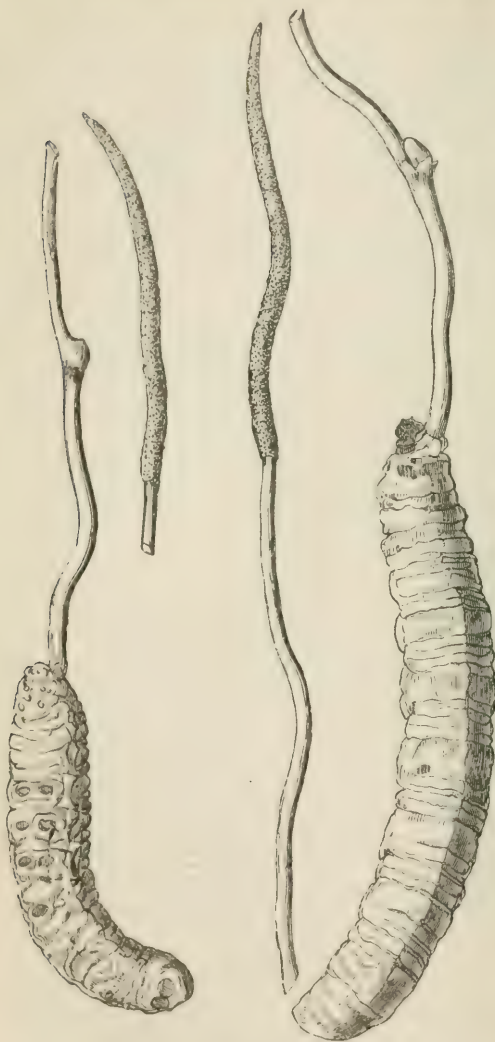


Fig. XXV.

*Philosoph. Journ.* xiv. 369.)

A very curious phenomenon takes place in several species of the genus *Boletus*, and analogous appearances present themselves in other genera. The flesh, when broken, changes very rapidly from yellow or white to deep blue, and if the juice be squeezed out, though at first colourless, it quickly becomes blue. Professor Robinson of Armagh has ascertained that this is not a chemical action, but believes it to arise from some change in the molecular arrangement. Tannin, though prejudicial to most vegetables, is not so always to Fungi. A species of *Rhizomorpha* is often developed in tan-pits. The greatest proper heat met with by Dutrochet in the Vegetable Kingdom, with the

Fig. XXV.—*Sphaeria Robertsii*, growing from the enterpillar of a New Zealand moth called *Hepialus virescens*.



exception of that of the spores of *Arum*, when B. de Cuvier (Ann. Chem. Phys. 1810.) Fungine, which was considered as a simple body, has been shown by Gay-Lussac to consist of cellulose and a fatty matter. Payen (Compt. Rend. 1846, Moniteur, 1846) has given the following list of substances which enter essentially into the composition of Fungi: 1. Water. 2. Cellulose, constituting all the solid part of the mass, water of the tissue. 3. Three nitrogenized substances; one insoluble in water; a second soluble, coagulable by heat; a third soluble in alcohol. 4. Fatty matter and oil. 5. Starch. 6. Fatty substances, one fluid at an ordinary temperature, the other solid, crystallizable at the same temperature. 6. Sugar. 7. Matter capable of being turned brown by the action of free air. 8. An aromatic substance. 9. Traces of sulphur. 10. Traces of salts of silicic and potash. (Ann. of Nat. Hist. vol. ix. p. 224.) Some species, as *Aspergillus cantharellus*, *Clavaria coralloides*, and *Aquileus peripatus*, contain a great quantity of matter, which, according to La Bl. is *Mucine*. (Ann. Chem. Feb. 1843.) M. Bergey is of opinion that the poisonous qualities of Ergot are owing to an oily acid principle. (Ann. de Ch. Med.) Unlike other plants, Fungi, instead of purifying the air by taking it of its carbonic acid and restoring the oxygen, vitiate it by exhaling carbonic acid, and absorbing oxygen. This has been proved experimentally by Dr. Marrot of Geneva, and will probably explain the cause of Fungi being so universally destroyers of green colouring matter, which we know results from the decomposition of carbonic acid. Certain Fungi in an imperfect state are said by Cagniard-Latour, Schwann, and others, to be connected with the process of fermentation. The curious circumstance that in certain bakehouses all the bread becomes ripy, and though sometimes prevented from assuming this condition by repeated washing of the walls and floor with chloride of lime, the evil is occasionally so obstinate as to prove the ruin of the establishment, is probably dependent on the same cause. Dutrochet believes that he has witnessed the growth of a *Penicillium* from the globules of milk. (Chimie de Latour, L'Indust. Feb. 1837; *Monat. Jahrb.* 1833; *Dutrochet Ann. des Sc. Nat.* N. S. Z. 4. vol. viii.)

\* Although the Fumal Alliance is not formally broken up into National Options, yet the following may be regarded as their names and regular characters:

- |  |                                  |
|--|----------------------------------|
| Spores generally peridermate on distinct Sporephores, Hyphae not naked   | ( 6. HYPHENOMYCELES, AGGREGATUS. |
| Spores generally peridermate on distinct Sporephores, Hyphae fringed on a Peridium                                 | ( 7. GASTROSPORA, LYSOSPORUM.    |
| Spores single, often septate, on more or less distinct Sporephores, Flood of the fruit elastic or more peridermate | ( 8. CONCOMITARIA, LUCIDARIA.    |
| Spores naked, often septate. Thallus flexuose  | ( 9. HYMENOMYCELES, POLYSPORA.   |
| Spores contained generally eight together in asci  | ( 10. ASCOMYCELES, HENICOLLITES. |
| Spores surrounded by a viscid (silk) or spangly gum. Thallus flexuose  | ( 11. PHENICOMYCELES, MITOCOMA.  |

GENERA.

Contents: I.—Syntax, 171.

COLORED BY THE SUN

- [illegible]



Cyphella, *Fr.*  
Hypochnus, *Ehb.*

Suborder V. *Clavati.*  
Sparassis, *Fr.*

Clavaria, *L.*  
Calocera, *Fr.*  
Crinula, *Fr.*  
Typhula, *Fr.*  
Pistillaria, *Fr.*

Suborder VI. *Tremel.*  
*lino.*  
Tremella, *Dill.*  
Coryne, *Nees.*

Exidia, *Fr.*  
Nematelia, *Fr.*  
Daecrymyces, *Fr.*  
Lenalis, *Fr.*  
Hymenula, *Fr.*

# Ordo II.—GASTEROMYCETES.



Fig. XXVI

Suborder I. *Podaxinei.*  
Mont.  
Montagnea, *Fr.*  
Gyrophragmium, *Mont.*  
Polyplocium, *Berk.*  
Secotium, *Kze.*  
Podaxon, *Desv.*  
Cauloglossum, *Fr.*  
Cycloderma, *Kl.*

Suborder II. *Hypogei.*  
*Berk.*  
Gautieria, *Vitt.*  
Splanchnomyces, *Corda.*  
Hymenangium, *Kl.*  
Octavianna, *Tul.*  
Melanogaster, *Cord.*  
Hyperhiza, *Bosc.*  
Hydnangium, *Wallr.*  
Hysterangium, *Vitt.*

Suborder III. *Phalloidei.*  
*Fr.*  
Phallus, *L.*  
Aseroe, *Labill.*  
Calathiscus, *Mont.*  
Lysurus, *Fr.*  
Simblum, *Kl.*  
Clathrus, *Mich.*  
\*Laternea, *Turp.*  
\*Colus, *Car. & Sech.*  
\*Gethria, *Brown.*  
Hæodictyon, *Tul.*

Suborder IV. *Trichogastres.*  
Batarrea, *P.*  
Tulostoma, *P.*  
Lycoperdon, *Tourn.*  
Scoleotrichum, *Berk.*  
Phellorinia, *Berk.*  
Broomeia, *Berk.*  
Geaster, *P.*  
Plecostoma, *Desv.*  
Myriostoma, *Desv.*  
Diploderma, *Lk.*  
Bovista, *Dill.*

Hippoperdon, *Mont.*  
Mycenastrum, *Desv.*  
Scleroderma, *P.*  
Polysaecum, *Desp.*  
Polyancium, *Lk.*  
Ciliocarpus, *Corda.*  
Arachnion, *Schwein.*  
Polygaster, *Fr.*  
Mitremyces, *Nees.*  
Cenococcum, *Fr.*  
Pilacre, *Fr.*

Subord., V. *Myxogastres.*  
Lycogala, *Mich.*  
Reticularia, *Bull.*  
Æthallium, *Lk.*  
Ptychogaster, *Corda.*  
Spumaria, *P.*  
Diderma, *P.*  
Polyschismium, *Corda.*  
Didymium, *P.*  
Tripotrichia, *Corda.*  
Trichamphora, *Jungb.*  
Physarum, *P.*  
Ancioridium, *Grer.*  
Trichosecyale, *Corda.*  
Craterium, *Trent.*  
Stegobolus, *Mont.*  
Stegasma, *Corda.*  
Diachea, *Fr.*  
Stemouitis, *Gled.*  
Dictydium, *Schrad.*  
Cribraria, *Schrad.*  
Arcyria, *Hill.*  
Trichia, *Hall.*  
Perichana, *Fr.*  
Licea, *Schrad.*  
Cirrhulus, *Mart.*

Suborder VI. *Nidulariacei.*  
Nidularia, *P.*  
Cyathus, *Hall.*  
Crucibulum, *Tul.*  
Sphaerobolus, *Tode.*  
Thelebolus, *Tode.*  
Atractobolus, *Tode.*

# Ordo III.—CONIOMYCETES, *Fr.*

Suborder I. *Sphaerocnemi.*  
Corda.  
Microthyrium, *Desm.*  
Coniothyrium, *Corda.*  
Sædium, *Nees.*  
Leptostroma, *Fr.*  
Phoma, *Fr.*  
Leptothyrium, *Kze.*  
Actinothyrium, *Kze.*  
Aposporium, *Kze.*  
Microthecium, *Corda.*  
Cryptosporium, *Kze.*  
Sphaconema, *Fr.*  
Apospharia, *Berk.*  
S. acuta, *Hoffm.*  
Aerosporium, *Tode.*  
Diplodia, *Fr.*  
Hendersonia, *Berk.*  
Lichenopsis, *Schwein.*  
Pyrenotrichum, *Mont.*  
Verticillaria, *Tode.*  
Phlyctidium, *Not.*  
Septoria, *Fr.*  
Diaphosporium, *Desm.*  
Neotrypspora, *Desm.*  
Pestalotia, *Not.*

Angiopoma, *Lév.*  
Prosthemium, *Kze.*  
Asteroma, *D. C.*  
Couturia, *Castg.*  
Bryocladium, *Kze.*

Suborder II. *Melanconiei.*  
Corda.

Melanconium, *Lk.*  
Stegosporium, *Corda.*  
Stilbospora, *P.*  
Sematosporium, *Corda.*  
Asterosporium, *Kze.*  
Cytispora, *Fr.*  
Guthospora, *Grer.*  
Nemaspora, *P.*  
Coryneum, *Kze.*  
Selenosporium, *Corda.*  
Baetridium, *Kze.*  
Botryospora, *Schwein.*  
Myrioccephalum, *Not.*  
Hyperomyxa, *Corda.*

Suborder III. *Phragmotrichacei.*

Endotrichum, *Corda.*

Schizoxylon, *Fr.*  
Schizothecium, *Corda.*  
Pilidium, *Kze.*  
Excipula, *Fr.*  
Seiridium, *Nees.*  
Phragmotrichum, *Kze.*  
Endotrichum, *Corda.*  
Schizoxylon, *P.*

Suborder IV. *Torulacci.*  
Cord.

Torula, *P.*  
Conoplea, *P.*  
Ceratospira, *Schwein.*  
Clasterispora, *Schwein.*  
Spira, *Corda.*  
Dictyosporium, *Corda.*  
Gyrocerus, *Corda.*  
Helicomyces, *Corda.*  
Bispora, *Corda.*  
Septonema, *Corda.*  
Trimmatostroma, *Corda.*  
Alternaria, *Corda.*  
Dicoccum, *Corda.*  
Sporidesmium, *Lk.*

Coniothecium, *Corda.*  
Hymenopodium, *Corda.*  
Echinobotrys, *Corda.*  
Spilocæa, *Fr.*

Suborder V. *Pucciniei.*  
Xenodochus, *Schlecht.*  
Aregma, *Fr.*  
Triphragmium, *Lk.*  
Puccinia, *P.*  
Gymnosporangium, *Lk.*  
Podisoma, *Lk.*

Suborder VI. *Creomacei.*  
Corda.

Uredo, *P.*  
Pileolaria, *Castg.*  
Ustilago, *Lk.*  
Sporisorium, *Ehb.*  
Testicularia, *Kl.*  
Tubercinia, *Fr.*  
Cronartium, *Fr.*  
Ræstelia, *Reb.*  
Graphiola, *Poit.*  
Æcidium, *Gmel.*

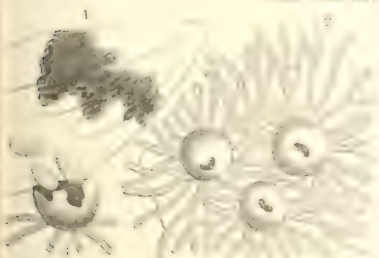
Fig. XXVI.—1. Polyplocium inquinans, divided vertically, natural size; 2. flocci and spores; 3 and 4, the same more highly magnified.—*Berkewy.*



**Figure 1**

[illegible]
$$C_{\text{max}} = 11.7 \pm 2.5 \text{ mg/L}$$
[illegible]

On 10 May 1995, the *U.S.S. Albatross* (*AGOS 10*)



E. ANNAL

[illegible]

\* The mode of fructification is the same as in *Leptocarpus* and *Leptocarpus*, but the reproductive bodies appear to be

Fig. XXVII. *Pisomaxo rufipalpis*. (1) Antenna; (2) fore tibia; (3) fore tibia; (4) fore tibia; (5) fore tibia; (6) fore tibia; (7) fore tibia; (8) a sparse sensate bristle and discal sensilla; (9) a sensilla; (10) a sensilla.



*Genera not sufficiently known.*

*Papularia*, Fr.  
*Phyllædium*, Fr.  
*Hypoblenium*, Lk.  
*Sclazoderma*, Kze.  
*Protomyces*, Unger.  
*Gymnosporium*, Corda.  
*Leucosporium*, Corda.  
*Chromosporium*, Corda.  
*Conisporium*, Lk.  
*Coccularia*, Corda.  
*Entonyelium*, Wallr.  
*Myxosporium*, Corda.  
*Fusoma*, Corda.  
*Apotemnoma*, Corda.  
*Ramularia*, Unger.  
*Athelia*, P.  
*Acrothamnium*, Nees.  
*Alytosporium*, Lk.  
*Capillaria*, P.  
*Cinclotrichum*, Nees.  
*Pleotrichum*, Corda.  
*Mainomyces*, Corda.  
*Chrysosporium*, Corda.  
*Chromosporium*, Corda.  
*Myxonema*, Corda.  
*Melanotrichum*, Corda.  
*Mennonium*, Corda.  
*Merosprium*, Corda.

*Coccotrichum*, Corda.  
*Didymaria*, Corda.  
*Scoliotrichum*, Kze.  
*Myxocladium*, Corda.  
*Sorediosporium*, Corda.  
*Azoama*, Corda.  
*Mydonotrichum*, Corda.  
*Macroom*, Corda.  
*Coccosporium*, Corda.  
*Diplosporium*, Lk.  
*Mydonosporium*, Corda.  
*Gliotrichum*, Eschew.  
*Balanium*, Wallr.  
*Gongylocladium*, Wallr.  
*Trichosporium*, Corda.  
*Trichostroma*, Corda.  
*Medusula*, Corda.  
*Spondylocladium*, Mart.  
*Aerophyton*, Eschew.  
*Clisosporium*, Fr.  
*Tipularia*, Chev.  
*Asterothecium*, Wallr.  
*Amphisporium*, Lk.  
*Hypheia*, Fr.  
*Trichoderma*, P.  
*Ostracococcum*, Wallr.  
*Myrosprium*, Corda.  
*Cylidium*, Wallr.  
*Gouppilia*, Merat.

*Diploderma*, Lk.  
*Anixia*, Fr.  
*Ceratophora*, Humb.  
*Hydnocaryon*, Wallr.  
*Ascospora*, Fr.  
*Hercospora*, Fr.  
*Coccobolus*, Fr.  
*Ostropa*, Fr.  
*Hypospila*, Fr.  
*Gibbera*, Fr.  
*Valsa*, Fr.  
*Podostromium*, Kze.  
*Collacystis*, Kze.  
*Pyrenium*, Tode.  
*Acinula*, Fr.  
*Scleroceocum*, Fr.  
*Sarea*, Fr.  
*Phymatostroma*, Corda.  
*Melanostroma*, Corda.  
*Gliostroma*, Corda.  
*Dermosporium*, Lk.  
*Chroostroma*, Corda.  
*Crocysporium*, Corda.  
*Myxadium*, Wallr.  
*Myxomphalon*, Wallr.  
*Hirneola*, Fr.  
*Amphicorda*, Fr.  
*Epichysium*, Tode.  
*Gyrolophium*, Kze.  
*Sprendonema*, Desm.

*Cælosporium*, Lk.  
*Dryophilum*, Schwein.  
*Malacharia*, Fée.

*Spurious Genera.*

*Rhizomorpha*, Ach.  
*Byssus*, L.  
*Mycoderma*, P.  
*Mycomater*, Fr.  
*Tophora*, Fr.  
*Herpotrichum*, Fr.  
*Fibrillaria*, P.  
*Himantia*, P.  
*Capillaria*.  
*Ozonium*, Lk.  
*Chætosporium*, Corda.  
*Erineum*, P.  
*Septotrichum*, Corda.  
*Physoderma*, Wallr.  
*Cephaleuros*, Kze.  
*Sphinctrina*, Fr.  
*Sclerotium*, P.  
*Rhizoctonia*, Fr.  
*Spermædia*, Fr.  
*Pachyma*, Fr.  
*Nosophlæa*, Fr.  
*Peribotryon*, Fr.  
*Ectostroma*, Fr.  
*Institale*, Fr.  
 &c. &c. &c.

NUMBERS.—GEN. 598. Sp. 4000? M. J. B.

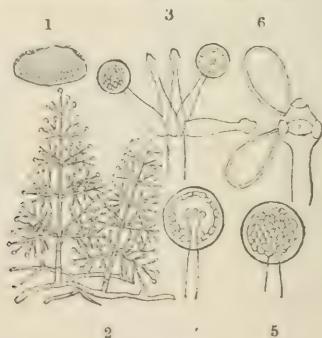


Fig. XXVIII.

tion of spores. At least this is the case, according to Corda, in some genera. Should this structure be found to prevail generally, it would become a question whether they should not be associated with the sporiferous fungi, the vesicle being regarded simply as a veil. I am myself inclined to this view, but at present think it savours too much of theory to venture to propose it.

Fig. XXVIII. *Acrostalacmus cinnabarinus*.—1. A patch, the natural size; 2. plants very highly magnified; 3. a portion of the fructification still more magnified; 4, 5. spores contained in gelatinous heads; 6. a point of a branch with two spores remaining upon it.

I am indebted to my valuable friend, the Rev. M. J. Berkeley, for the following additional remarks:—

Attention has of late been frequently called to parasitic fungi, because of their real or supposed connection with the diseases which have proved so disastrous to potatoes and grapes. It is at least clear that these diseases are constantly attended by specific fungi, which are highly destructive, but it is very probable that the exciting cause has been the introduction of foreign manures into general use, which have injured the constitution of the subjects, and rendered them liable to any external attack. As in the history of all diseases, and especially as regards infection and contagion, a thousand anomalies occur on every side, but the notion above stated is the only one which meets the generality of undoubted facts, and which does not clash with what is clearly ascertained respecting the agency of fungi in these cases, for like *Puccinia graminis*, both *Botrytis infestans* and *Oidium Tuckeri* are developed amongst living, though possibly unhealthy tissues which are either immediately destroyed or materially affected by their presence. No cure has been discovered for the potato



maurain, but the use of a solution of sulphur and lime is generally advised in the grape vineyard, and is equally applicable in all diseases which proceed from a similar parasite, as peach and rose mildew, hop mildew, &c.—*Recht. France, med. Chém. journal, &c.*

Mr. Graham attributes the mild disposition caused by fungi amongst some fishes, not to the more elaborated consequent on their nutrition, but to the agency of dead mycelium acting as a putrefactive humoral.—*Journal of Bot. Soc. Lond.*

The effects of fungi on animal structures have lately been more particularly studied, and a host of facts are now on record, which show that many diseases, especially those which are cutaneous, are attended with the growth of fungi. The case of M. Cantine has long been known, but that of *Paronychia* and others are no less certain. Full information on this point will be found in Robin's *Hygiène publique et sur l'Homme et les Animaux*. A great deal has been written respecting the supposed occurrence of fungi in the examinations of patients suffering from cancer. Much arose from incorrect observation, and there is no reason to be seen that there is any foundation for the notion that the disease and the vegetable were at all connected. It is, however, singular that very complicated cancers did constantly accompany the disease in the West of England, and that no one has yet been able to refer them to their proper origin. They were once supposed to be identical with Bunt, but their size and structure are quite at variance with this notion.—See *Lond. Med. Gaz. Sep. 28, 1842*. "Bunt on Malignant Chancera." "Growth and Detachment of Chancra Bolls," in *Lond. Med. Gaz. 1842*. *Report of Coll. Phys. on Chancra Bolls*.

It has been long known that poisonous fungi are more dangerous in proportion to their age, and it has been supposed that this circumstance was due to the increased number of spores. A case has just been reported to us in which serious though temporary inconvenience was experienced from tasting a small quantity of the spores of *Lactarius scaber*.

New light has been thrown by Monsieur Tulane on the nature of ergot. It appears, not only from his researches, but from other facts which were observed about the same time, that ergot is really a myceloid state of certain fungi allied to the well-known Insect Fungus of New Zealand.—*Tul. in Comptes Rendus, 1851*. It is obvious, that notwithstanding the strong specific action which ergot exercises on the uterus, and the frightful disease which it causes, when existing in any considerable quantity in bread-corn, that it is devoured raw with impunity by children in some parts of the continent, who know it under the name of St. John's Bread. If what is stated above respecting the true nature of ergot be correct, the *Oidium abortivum* must be a second form of fruit, in accordance with many facts observed lately in fungi. Very long ago announced the fact, that several genera supposed to be distinct are in fact merely different forms of fructification, as *Cylindrospora* of *Sphaeria*, *Dampiera* of *Uromyces*, *Peziza* of *Puccinellia*, &c. These views were, however, considered problematical till the matter was taken up by Tulane, who has collected many facts connected with the subject, while Messrs. Berkeley and Broom have in more than one instance detected two supposed genera growing from a common stroma. *Sphaeria aquatica*, for instance, was discovered bearing asci internally, and naked spores, still dependent on the apothecium of the same perithecium. In *Typharia* also, in the same cup, perfect as well as those from the side of naked didymous spores. The mycelium of *Sphaeria Dampiera* was observed to have distinct spores towards the tips of the filaments, constituting it a true mould. It is very probable that the genera of fungi will be greatly reduced by the continuance of such observations, and that double fructification will be found as general amongst fungi as it has been found to be the case by Tulane amongst lichens.—See *Tul. in Comptes Rendus, 1851*. *Berk. and Br. in Hook. Lond. Journ. 1851*.

Fungi have the power of penetrating very deeply into compact cellular and fibrous structures by means of their mycelium. In hard wood which has been long exposed, mycelium is found not only running between and over the various tissues, but within their cavity. It has been stated that strong scents, such as that of Russia leather, are unfavourable to the growth of fungi. It is, however, asserted that in some French books bound in strong scented leather are as subject to be attacked as others.

Since the publication of the first edition of this work, the Messrs. Villiers have extended their observations to various genera of fungi, but especially with greater success than amongst those which grow beneath the surface of the earth. The growth of the asci and sporophores from the cellular tissue, and the vascular tissue which it assumes, are figured with such precision as to leave nothing for future observation. All attempts at artificial cultivation at a distance from the truffe have hitherto failed, and their elaborate work, which enters into every detail of history as well as structure, gives no prospect of success.—*Comptes Rendus Hygiène 1851*.

The present warm summer has produced in France a reputation of the serious



phenomenon of the appearance of blood-coloured spots on various articles of food. Dr. Montagne, when at Rouen in July, had many opportunities of examining food of various kinds, both animal and vegetable, which was so spotted in a few hours. He found the red substance to be precisely the same with that reported on by Ehrenberg at Berlin, and he was able to propagate it at pleasure on rice paste. He refers the production to the genus *Palmella*, but the whole history is against its being an Alga. It is more probable that it is a fungus of the lowest order, similar to the white opaline specks which so often occur on meat and other substances in an incipient state of decay.—*Montagne in Comptes Rendus*, 1852.

Dr. Hassall announced in the *Lancet*, two years since, the discovery of the full development of the yeast fungus: but as his fungus merely appeared on a solution of malt, it was as uncertain as before what was the true nature of the yeast plant. Mr. Berkeley and Mr. G. H. Hoffman succeeded in tracing its development from the globules of yeast to a perfect state, exactly according with the plant of Dr. Hassall, but their observations have not yet been published. By similar observations of thin slices of a sclerotium inclosed in a microscopic cell, they were enabled to trace the development of its cellular tissue into a mucor, thus confirming the notion that *Sclerotia* are really nothing more than a compact mycelium.—*Hort. Trans.*, 1848.

Few subjects are more obscure than that of the production of parasitic fungi. It is almost certain that the reproductive bodies circulate with the sap into the most intimate cavities, and in a form so minute as not to be recognised by the most searching microscope. A curious case is noticed by Mr. Berkeley in the *Gardener's Chronicle* for Sep. 20, 1851, of a new fungus produced on *Nocera* onions from seed, received from the Horticultural Society. This fact by itself is of little importance, had not the same thing occurred in a different part of the country with seed received from the same quarter. The Rev. M. A. Curtis has lately sent the same thing on a very white skinned onion from Pennsylvania. Something similar was observed with plants of *Pyraecantha* raised from Russian seeds in the garden of the Horticultural Society at Chiswick.

Perfect moulds belonging to more than one genus, and amongst them *Penicillium*, have been found inclosed in amber.—*Berk. in Ann. of Nat. Hist.*, Dec. 1848.

- |  |   |   |                         |
|--|---|---|-------------------------|
| • <i>Hiatula</i> , Fr. next <i>Lepiota</i> .                                     |   | <i>Satyrius</i> , Bosc.                                 |                         |
| • <i>Stropharia</i> , Fr.  | { next <i>Psalliota</i> .                       | <i>Mutinus</i> , Fries.                                 | } next <i>Phallus</i> . |
| • <i>Pilosace</i> , Fr.  |   | <i>Corynitis</i> , Berk.                                |                         |
| <i>Rhymosia</i> , P.   | — <i>Paxillus</i> .                             | <i>Aserophallus</i> , Mont.                             |                         |
| <i>Ruthera</i> , Opatowski.  |   | <i>Dictyophallus</i> , Perrotet.                        |                         |
| • <i>Linacium</i> , Fr.  | { subgenera of <i>Hygro-</i><br><i>phorus</i> . | <i>Dictyophora</i> , Desvaux.                           |                         |
| • <i>Camarophyllus</i> , Fr.   |   | <i>Hymenophallus</i> , Nees.                            |                         |
| • <i>Hymenocbe</i> , Fr.   |   | <i>Staurophallus</i> , Mont.                            |                         |
| <i>Arrhenia</i> , Fr. next <i>Nyctalis</i> .                                     |   | <i>Dentromyces</i> , Liboschutz = <i>Batarrea</i> .     |                         |
| • <i>Collybia</i> , Fr.  | { subgenera of <i>Marasmius</i> .               | <i>Schizostoma</i> , Ehb. = <i>Tulostoma</i> .          |                         |
| • <i>Rutulen</i> , Fr.   |   | <i>Scoleiocarpus</i> , Berk. = <i>Arachnion</i> .       |                         |
| • <i>Eupolyporus</i> , Fr.   | { subgenera of <i>Polyporus</i> .               | <i>Langermannia</i> , Rostk. = <i>Lycoperdon</i> .      |                         |
| • <i>Fomes</i> , Fr.   |   | <i>Favillea</i> , Fr. next <i>Phellorinia</i> .         |                         |
| • <i>Polysetica</i> , Fr.  |   | <i>Xylopodium</i> , Mont. near <i>Phellorinia</i> .     |                         |
| <i>Theleporus</i> , Fr. next <i>Merulius</i> .                                   |   | <i>Trichocystyle</i> , Cda.                             |                         |
| <i>Arrhytidia</i> , Berk. near <i>Merulius</i> .                                 |   | <i>Trichocoma</i> , Jungh. } before <i>Broomeia</i> .   |                         |
| <i>Eichlophora</i> , P. = <i>Phlebia</i> .                                       |   | <i>Trichaster</i> , Czernai, next <i>Geaster</i> .      |                         |
| <i>Maeronia</i> , Fr. next <i>Odentia</i> .                                      |   | <i>Laupila</i> , Fr.                                    |                         |
| <i>Lachnocladium</i> , Lev.  | { next <i>Thelephora</i> .                      | <i>Calvatia</i> , Fr.                                   |                         |
| <i>Eurocladus</i> , Lév.   |   | — before <i>Bovista</i> .                               |                         |
| <i>Cymatoderma</i> , Jungh. next <i>Cladoderis</i> .                             |   | <i>Sackea</i> , Rostk. = <i>Bovista</i> .               |                         |
| • <i>Malachodermum</i> , Fr. subgenus of <i>Stereum</i> .                        |   | <i>Pompholyx</i> , Cda.                                 |                         |
| <i>Leptochete</i> , Lev.   | { next <i>Stereum</i> .                         | <i>Phlyctospora</i> , Cda.                              |                         |
| <i>Hymenochaete</i> , Lev.   |   | <i>Sclerangium</i> , Lév. near <i>Scleroderma</i> .     |                         |
| <i>Perona</i> , Fr. = <i>Hypolyssus</i> .  |   | <i>Sterrebeckia</i> , Lk. before <i>Polygaster</i> .    |                         |
| • <i>Encora</i> , Fr.  | { subgenera of <i>Cora</i> .                    | <i>Gyropodium</i> , Hitchcock. } = <i>Mitremyces</i> .  |                         |
| • <i>Cilicia</i> , Fr.   |   | <i>Calostoma</i> , Desvaux.                             |                         |
| <i>Midotis</i> , according to Fries ascigerous, to be removed to <i>Dermia</i> . |   | <i>Hussea</i> , Berk. next <i>Mitremyces</i> .          |                         |
| • <i>Coniophora</i> , Pers. subgenus of <i>Corticium</i> .                       |   | <i>Xyloidium</i> , Czern. before <i>Reticularia</i> .   |                         |
| <i>Acutis</i> , Fr. next <i>Sparassis</i> .                                      |   | <i>Diphtherium</i> , Ehr. = <i>Reticularia</i> .        |                         |
| <i>Cucurmaria</i> , Corda = <i>Typhula</i> .                                     |   | <i>Lindbladia</i> , Fr. next <i>Æthallium</i> .         |                         |
| <i>Septocladia</i> , Bonorden = <i>Tremella</i> .                                |   | <i>Leocarpus</i> , Lk.                                  |                         |
| <i>Dendrodochium</i> , Bon. near <i>Tremella</i> .                               |   | <i>Badhamia</i> , Berk.                                 |                         |
| <i>Collyria</i> , Fr.  | { before <i>Exidia</i> .                        | <i>Claustria</i> , Fr.                                  |                         |
| <i>Himoda</i> , Fr.  |   | — next <i>Diderma</i> .                                 |                         |
| <i>Femsonia</i> , Fr. next <i>Exidia</i> .                                       |   | <i>Carcerina</i> , Fr.                                  |                         |
| <i>Phyllopta</i> , Fr. next <i>Nematelia</i> .                                   |   | <i>Comatricha</i> , Preuss. = <i>Physarum</i> .         |                         |
| <i>Cylindroscella</i> , Bon. = <i>Dacrymyces</i> .                               |   | <i>Trichamphora</i> , Jungh. } next <i>Craterium</i> .  |                         |
| <i>Hormomyces</i> , Bon. near <i>Dacrymyces</i> .                                |   | <i>Tilmadoche</i> , Fr.                                 |                         |
| <i>Epidochium</i> , Fr.  | { next <i>Hymenella</i> .                       | <i>Stegobolus</i> , Mont. should be placed amongst      |                         |
| <i>Catinula</i> , Lév.   |   | <i>Lichenales</i> , near <i>Parmelia</i> .              |                         |
| <i>Sarcopodium</i> , Ehb.  |   | <i>Stylonites</i> , Fr.                                 |                         |
| <i>Rhizogon</i> , Tul. &c. = <i>Splanchnomyces</i> , Cda.                        |   | <i>Enerthenema</i> , Bowman. } next <i>Stemonitis</i> . |                         |
|  |   | <i>Nassula</i> , Fr. next <i>Cribraria</i> .            |                         |
|  |   | <i>Hyporhamna</i> , Cda. = <i>Trichia</i> .             |                         |
|  |   | <i>Lachnobolus</i> , Fr. next <i>Trichia</i> .          |                         |







*Fromelia*, Lév. } = *Morchella*.  
*Mitrophora*, Lév. }  
*Gyromitra*, Fr. next *Morchella*.  
*Biverpa*, Fr. subgenus of *Helvella*.  
*Cidarisa*, Fr. }  
*Cudonia*, Fr. } next *Rhizina*.  
*Discina*, Fr. }  
*Otidea*, P. subgenus *Peziza*.  
*Helotium*, Fr. }  
*Chlorosplenium*, Fr. } next *Peziza*.  
*Dubonia*, Fr. }  
*Pyronema*, Mart. }  
*Psilopezia*, Berk. }  
*Orbilia*, Fr. before *Solenia*.  
*Angelina*, Fr. before *Ascobolus*.  
*Kiedera*, Fr. }  
*Calloria*, Fr. } before *Agyrium*.  
*Niptera*, Fr. }  
*Lichenopsis*, Schw. next *Stictis*, not *Hendersonia*.  
*Nævia*, Fr. } next *Stictis*.  
*Sericella*, Fr. }  
*Xylographa*, Fr. next *Propolis*.  
*Ombrophila*, Fr. before *Bulgaria*.  
*Microstoma*, Bernstein, near *Bulgaria*. = *Pez.*  
*protracta*, Fr. Nov. Act. Ups. 1851.  
*Enslinia*, Fr. next *Cyttaria*.  
*Schmitzonia*, Fr. next *Ditella*.  
*Hydnotrya*, Berk. & Fr. before *Hydnobolites*.  
*Aschaen*, Wallr. = *Tuber*.  
*Oogaster*, Cda. subgenus of *Tuber*.  
*Hydnocystis*, Tul. next *Picea*.  
*Stephensia*, Tul. near *Genea*.  
*Paurocystis*, Berk. near *Stephensia*.  
*Genabea*, Tul. next *Sphaerosoma*.  
*Ceratogaster*, Cda. = *Elaphomyces*.  
*Bloxamia*, Berk. & Broome, near *Stegia*.  
*Lachnella*, Fr. before *Patellaria*.  
*Papella*, Chev. = *Patellaria*.  
*Laquearia*, Fr. }  
*Hymenobolus*, Mont. } next *Patellaria*.  
*Trochila*, Fr. }  
*Urnula*, Fr. before *Cenangium*.  
*Colpoma*, Wallr. next *Cenangium*.  
*Gleniopsis*, Not. before *Glonium*.  
*Ostropa*, Fr. }  
*Rhaphidospora*, Fr. } next *Actidium*.  
*Gibbera*, Fr. }  
*Dichema*, Fr. }  
*Phaeosporium*, Wallr. }  
*Neurocium*, Kze. } before *Rhytisma*.  
*Ephelis*, Fr. }  
*Melanosporus*, Not. = *Rhytisma*.  
*Lophoderma*, Fr. next *Rhytisma*.  
*Coccomyces*, Not. next *Phacidium*.  
*Hypoderma*, D.C. subgenus *Hysterii*.  
*Lophoderium*, Not. next *Hysterium*.  
*Schrothium*, Desm. near *Hysterium*.  
*Hormospora*, Not. next *Hypocrea*.  
*Coriycopsis*, Fr. }  
*Kentrosporium*, Wallr. } before *Thamnomycetes*.  
*Xyleria*, Schrank. }  
*Leveillea*, Fr. }  
*Phylacta*, Lév. }

*Camillea*, Fr. }  
*Bacillaria*, Mont. } next *Thamnomycetes*.  
*Poronia*, Fr. }  
*Diatrype*, Fr. }  
*Valsa*, Fr. }  
*Torsellia*, Fr. } next *Hypoxylon*.  
*Endothia*, Fr. }  
*Melogramma*, Fr. }  
*Nectria*, Fr. before *Sphaeria*.  
*Isothea*, Fr. }  
*Hypospila*, Fr. }  
*Stigmatia*, Fr. }  
*Ceratostoma*, Fr. }  
*Scopinella*, Lév. }  
*Massaria*, Not. } next *Sphaeria*.  
*Hercospora*, Fr. }  
*Venturia*, Not. }  
*Rosellinia*, Not. }  
*Bertia*, Not. }  
*Oomyces*, Berk. & Br. near *Sphaeria*.  
*Halonis*, Fr. }  
*Pyrenophora*, Fr. }  
*Circinaria*, Bon. = *Sphaeria circinnate*.  
*Pustularia*, Bon. = *S. pustulate*.  
*Synsphaeria*, Bon. = *S. versatiles*.  
*Pyrenodochium*, Bon. = *S. lignosae*.  
*Pyrenodermium*, Bon. = *S. connate*.  
*Ascostroma*, Bon. = *S. glebosae*.  
*Pulvinaria*, Bon. = *S. pulvinata*, &c.  
*Coleroa*, Raben. near *Dothidea*.  
*Microthyrium*, Desm. next *Micropeltis*, not *Coniophyrium*.  
*Alphitomorpha*, Walr. = *Erysiphe*.  
*Podosphaera*, Kze. }  
*Sphaerothera*, Lév. } next *Erysiphe*.  
*Phyllactinia*, Lév. }  
*Uncinula*, Lév. }  
*Microsphaeria*, Lév. }  
*Calocladia*, Lév. }  
*Asterina*, Lév. } next *Perisporium*.  
*Lembosia*, Lév. }  
*Scorias*, Fr. has asci, and is therefore not related to *Isaria*.  
*Capnodium*, Mont. next *Scorias*.  
*Dendropogon* = *Antennaria*.  
*Zasmidium*, Fr. }  
*Myxothecium*, Kze. } near *Antennaria*.  
*Pleurocystis*, Bon. subgenus *Ascophora*.  
*Eurotium*, which has asci, must be removed near *Onygena*.  
*Collacystis*, Kze.  
*Ascomyces*, Mont. & Desm. near *Mucor*.  
*Note*.—The views of the affinities of *Mucorini* mentioned in the note have lately been singularly confirmed by a structure which has been detected by Tulasne in the genus *Hymenangium*.  
*M. I. B.*  
*Scopularia*, Preuss. = *Gliotrichum*, an Alga.  
*Hystriopsis*, Preuss. = *Trichoderma*.  
*Crocisporium*, Cda. = *Dermosporium*.  
*Trichostroma*, Preuss.  
*Plenodomus*, Preuss.  
*Chenocarpus*, Reb.  
*Chaetotrichum*, Rab.



Alliance III. *LICHENALES*—THE LICHEN ALIANCE[illegible]

**Diagnosis:** *Callitriche flammula* plants, associated through their whole surface by the numerous in which they articulate; living in wet, dampened by green water, inland in wet, and always having green water in their bodies.



1978 XXXIX

Perennial plants, often spreading over the surface of the earth, or roots, or trees, in dry places, in the form of a lobed and foliaceous, or hard and crustaceous, or leathery substance, called a thallus. This thallus is formed of a cortical and medullary layer, of which the former is simply cellular, the latter both cellular and fibrous; or the



11. 2. 2.

crustaceans. Species too, within one secondary layer differ chiefly in texture, and in the degree to which colored, the latter is darker; but in the furthestmost or tertiary species, the nodulosity is distinctly fibrous, in the latter occupying the lower part of the shell, in the former confined to the central part. Dermal secretions of two kinds is generally, or long in most forms, the former takes the form assumed by that of the mollusks, sometimes, with tubes through the external layer, and others and smaller, in comparison to the size of the former all have pores called stigmata. In the crustaceans

cellules of the medullary layer of the thalamus. These, called *geminæ*, or *gemmiformes*

FIG. XXIX. 1, Stands of *Valoniopsis* (moss); 2, a piece of the thallus of *Stictis polymorpha*, with leaves and stipes; 3, a stand of *Stictis polymorpha*; 4, a stand of *Stictis polymorpha*; 5, the stipe of *Stictis polymorpha*; 6, a stand of *Stictis polymorpha*; 7, a stand of *Stictis polymorpha*; 8, a stand of *Stictis polymorpha*; 9, a stand of *Stictis polymorpha*; 10, a stand of *Stictis polymorpha*; 11, a stand of *Stictis polymorpha*; 12, a stand of *Stictis polymorpha*; 13, a stand of *Stictis polymorpha*; 14, a stand of *Stictis polymorpha*.

Fig. XXX—Section of a series of lacunae (1000x). 108



universally of a green colour, and either lie singly or in clusters beneath the cortical layer of the thallus, or break out in clusters called soredia, or in cups called cyphelia.



Fig. XXXI.

yellow; others spread upon the ground in plantations and heaths—these have usually a much larger growth; some again hang from the branches of venerable trees, which they clothe with a shaggy beard of grey; and, finally, a few start up upon the heath, grey and deformed, but eventually fashioning themselves into tiny goblets, the border of which is studded with crimson shields. According to Fries, Lichens “are types of Algae born in the air, interrupted in their development by the deficiency of water, and stimulated into forming a nucleus by light. No Lichen is ever submersed (*Verrucaria submersa* is an exception); there is none of which the vegetation is not interrupted by the variable hygrometrical state of the atmosphere; and, finally, none that ever develop in mines, caverns, or places deprived of light. On this account, their shields are more rare in the fissures of mountains, or in shady groves, than in places fully exposed to light. In wet places, also, their shields are not produced; for so long as they are under the influence of water they are hardly distinguishable from *Hydrophyceae* (forms of Algae); as, for instance, *Collema*, &c. But these plants, when exposed to the sun, do perfect their shields, as is found by *Nostoc lichenoides*, *foliaceum*, &c., which, when dry, are ascertained to be *Collema limosum*, *flaccidum*, &c., surcharged with water.” By being acquainted with this rule, the same author says, he has succeeded in discovering many Swedish Lichens with shields, which have for many years been constantly found sterile; as *Parmelia conoplea*, *lanuginosa*, *gelida*, &c.; and he even asserts that he has succeeded artificially in inducing sterile Lichens to become fruitful, as *Usnea jubata*, and others.—*Plant. Hom.* 224. Lichens consist, according to Eschweiler, of a medullary and a cortical layer of tissue, of which the former is imperfectly cellular or filamentous, and bursts through the latter in the form of shields (apothecia), which contain a nucleus, consisting of a flocculent gelatinous substance, among which lie the cases of sporules. These cases (thece) are transparent membranous tubes, either simple or composed of several placed end to end, which either lie free in the nucleus, or are themselves contained in other membranous cases (asci). In the beginning Lichens are stated to be in all cases developed in humidity, and to be, in fact, at that time, mere *Phyceae* or *Confervee*; but as soon as the humidity diminishes, the under part dies, and an inert leprous crust is formed, which ultimately becomes the basis of the plant. Hence Lichens consist of two distinct sorts of tissue,—living cellules forming the vegetating part, and dead cellules the cohesion of which is lost; when separate, the former is *Palmella botryoides*, and the latter *Lepraria*. Of these two sorts of matter, the leprous is incapable of perpetuating the Lichen, while every part of the living stratum has been ascertained to become reproductive matter. See Fries, as above quoted, and Meyer *Ueber die Entwicklung, &c., der Flechten*. The investigations of the latter are exceedingly interesting. By sowing Lichens, he arrived at some curious conclusions, the chief of which are, that, like other imperfect plants, they may owe their origin either to an elementary, or a reproductive, generating power—the latter capable of development like the plant by which they are borne: that decomposed vegetable, and some inorganic, matter, are equally capable of assuming organisation under the influence of water and light; and that the pulverulent matter of Lichens is

Fig. XXXI.—Section of the shield of *Parmelia filiceae*; the green gonidia are the black dots beneath the side; 2. a portion of the same more magnified, showing the spore-cases and paraphyses; 3. a cluster of the shield of *Chelonia cucurbita*; 4. spores of *Parmelia parietina*.



that which is subject to this kind of indolent propagation, while the green (young) the last is the only part that will really multiply the species. He further says, that he has ascertained, by means of experiments from seed, that supposed spores and some genera of *Ascherson* are all forms of the same, as are *Imbricaria*, *Aschersonia*, *Leccaria*, *hircocalla*, and others, of the common *Parmelia* species.

The distinction between Lichens and Fungi has already been fully explained by Mr. Berkeley (p. 29). It is, therefore, only necessary, in this place, to give a few details concerning the geographical distribution and uses of the order, or class of orders, which Botanists combine under the name of Lichens.

Polycaulic Lichens are the first plants that clothe the bare rocks of ice-bergs, islands in the midst of the ocean, Polar regions, Lichens follow them, and then Mosses and Liverworts. (*Illustr. Ann. 8. p. 44*.) They are found upon trees, rocks, stones, bricks, pales, and similar places; and the same species seem to be found in some distant parts of the world; thus, the Lichens of North America differ little from those of Europe. They are not met with in aridifying matter, where they give rise to bog; but they often occupy the surface of living plants, especially their bark. In the tropics they lay hold of evergreen leaves. Their chosen climate is one that is temperate and moist; aspects to the north or west are also their favourite resort, for they shun the rays of the noon-day sun. No place seems to be a more constant home than the surface of sandstone rocks, and buildings, in cool and moist countries. They are met with, in one place or other, from the equator to the pole, and from the seashore to the limits of eternal snow. The most species are found near the equator; the more important, such as the crustaceous genera, which are hardly distinguished from the rocks they grow upon, are chiefly observed in mountains, and near the pole. The *Polithalami* are most abundant in tropical America.

Lichens have been remarked by De Candolle to possess two distinct classes of characters, the one rendering them fit for being employed as dyes after treatment with urine, the other making them nutritive and medicinally useful to man. Hæmmerlin has ascertained that certain of these exist in great abundance in Lichens, particularly in those which are granular and crumbly. The common *Verrucaria*, when it is found upon almost every old beech-tree, contains rather more than twenty-nine per cent. (*L. P. J. 12. 196*.) Lichens that grow on the summit of fir-trees have been found by John, of Berlin, to contain an uncommon proportion of oxide of iron, a curious illustration of the peculiar powers which various plants possess of separating the mineral matters present in them in their bark. (*Ann. 1. 204*.) Of those used in dyeing, the principal crustaceous kinds are, *Leccaria parula*, the *Orcella* of France, or *Peltia* d'Auvergne of the French, *Lecanora tartarea* (or *Contus*), *Leccanora*, and *atra*, *Verrucaria lutea*, *Leccanora scypharia* and *obscura*, *Isidium Wieringii*, *Lepraria chlorina*; of the foliaceous species, *Parmelia saxatilis*, *omphalodes*, *costarum*, *conspersa*, and *parietina*, *Sticta pulmonacea*, *Solorina crocea*, and *Gyrophora dealbata* and *pustulata*; but the most important are *Rocella tinctoria* and *fuciformis*, the first of which makes litmus, and is largely used by manufacturers under the name of Orsell, or Archill, or Orseille des Canaries; these are other species capable of being employed in a similar manner, as *Usnea plicata*, *Evernia prænosa*, *Atropa jubata*, *Ramalina scopulorum*, and several *Cenomyces*. Dr. Robert Thomson finds the common yellow pale Lichen (*Parmelia parietina*) to contain a peculiar coloring-matter, called *Parietin*, of a bright yellow. This is dissolved by a drop of strong acetic, or sulphuric acid; while minute quantities of ammonia, or other alkalies, change it to a rich red inclining to purple.

Agardh considers Lichens more nearly allied to Fungals than to Algae. He remarks that if *Sphaeria* or *Perizoma* had a thallus, they would be Lichens, and that the same part is all that determines such genera as *Calycium*, *Verrucaria*, or *Opogone* to be Fungals, and not Fungi. He adds, that all the transitions from Algae to the mass of Lichens, which have been detected by modern inquiries, are more direct than from the form of the Lichen tribe, and by no means into Lichens themselves.

According to Fries, Lichens have the vegetation of Algae, and the form of Fungi. (*Syst. 323*.)

Fries refers *Byssaceæ* to Lichens with the following short description:—*Annual, perennial, constantly growing, with filamentous texture; consisting of solid filices, either few or several glued together with a common bark, unrooted and permanent. Fructification homogeneous, growing externally, and naked.* (*Syst. 323. Fries 323*.) Some of these plants appear to be rather perennating; or perennating they are not, but they suddenly overrun all the leaves at times on the side next the wind in the neighbourhood of Dresden; on another, on the 24th of Aug. 1736, it took in an instant, spreading over the sails and masts of a ship at Stockholm; and Fries is disposed to transfer the extreme



like matter, that overruns the grass in the mornings of spring and autumn, of this nature, and not of an animal origin. See *S. O. Veg.* 313.\*



Fig. XXXII.

which forms the winter food of that animal, is *Cenomyce rangiferina*. *Parmelia parietina*, *Borreria furfuracea*, *Evernia prunastri*, *Cenomyce pyxidata* and *coccifera*, are reputed astringents and febrifuges, and *Peltidea aphthosa* an anthelmintic. *Alectoria Arabum* (Oschnah) is said to be sedative and soporific. *Peltidea canina* was once regarded as a specific in hydrophobia. *Sticta pulmonacea* is used in Siberia for giving a bitter to beer, and in this country is employed, under the name of Lungs of the Oak, as a nourishing diet for weak persons. *Evernia vulpina*, called Ulfmossa by the Swedes, is believed by that people to be poisonous to wolves; but this requires confirmation. See *De Cand. Essai Méd.* 313, and *Agardh, Aph.* 94.

According to the chemists, Lichens contain several peculiar principles; such as Cetrarine, Picrolichenine, Stictine, and Varioline, which are bitter; and the colouring matters called Orcine, Erythrine, Parmelochromine (also called Vulpuline and Vulpinic acid), Strychnochromine, Strychnerythrine, Lecanorine, &c.: and finally, from *Usnea florida*,

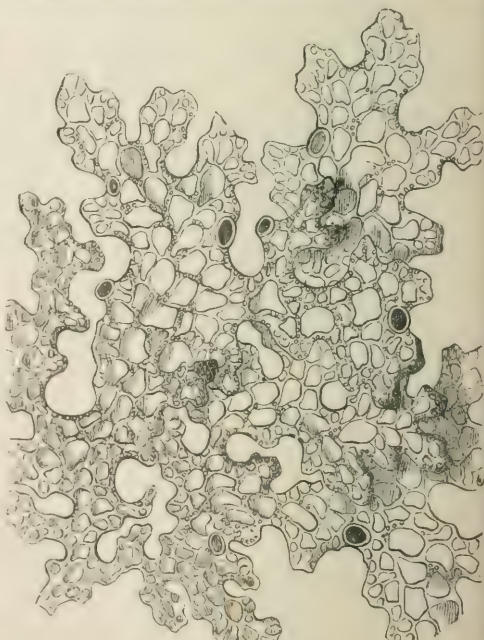


Fig. XXXIII.

\* Nothing, however, can be more heterogeneous than the mass of genera collected by Fries under the unfortunate name of *BYSSACEÆ*. Many of them are spurious genera, others true Fungals, a few anomalous Lichens, and a small portion not easily arranged under Fungals, Algae, or Lichens. An excellent notice will be found by Dr. Montagne in the History of Cuba, and the latest information on the subject in the article *Byssaceæ* in the new *Dict. d'Hist. Nat.* By excluding such genera as *Ciliata* and *Cenogium*, which the example of *Parmelia gossypina* will justify us in uniting with Lichens, we have remaining a very natural, though small group, which may be distinguished under the name of *Collema*; and Dr. Montagne, who has lately had some correspondence on the subject with

Fig. XXXII. — *Cetraria islandica*: *a a*. its shields; *b*. a shield magnified and divided vertically.

Fig. XXXIII. — *Sticta pulmonaria*, or Lungs of the Oak.



*hirta* and *plicata*, *Parmelia fraxinea* and *farinacea*, and *Uromyces atriceps*. Mr. Tremp has obtained a substance called Usnic or Usnic acid. The earliest fruit of the fungus contained and yellowish-green lichens are especially rich in usnic, the substance. *Lecidea geographica* and *Parmelia serotina*. Usnic acts as a cataplastic part by its various metamorphoses and combinations in the alterations of colour of many lichens. In all lichens however it is accompanied by yellow or green bases, which in combination with it partake of the property of becoming red by ammonia and exposure to the air; this red colouring however is destroyed by sulphuretted hydrogen. Usnic occurs in the thallus as well as in the fruit-dises. The spherules of the *Cladonia* contain near the fruit-bearing vesicles quill-shaped cylindrical cells, which are coloured pale red at the base, but darker towards the apex by a colouring substance, which dissolves in ammonia and potash with a wine-red, in sulphuric acid with a carmine-red colour; the sulphuric solution is precipitated by water; the alkaline solution is not decolourized by sulphuretted hydrogen. The nearly scarlet-red fruit-dises of the *Cladonia* become brown and blackish-brown with age. In fact, the fruit-dises of the lichens containing usnic are precisely similar in colour to the thallus, or brown, reddish-brown and carmine-red. The sulphur-yellow lichens contain most usnic acid, and indeed in a free state; the other colours are probably produced by the action of the alkalis and earths of the vegetable salts in the lichens, the ammonia of the rain-water assisting the chemical action of the usnic acid, which is otherwise insoluble in water. In this manner the green, red and brown colours may originate. The silver-white *Cenomyces canaliculatus* produces a solution of the usnic acid in the state of an earthy salt. *Lecidea geographica* is sometimes sulphur-yellow, sometimes yellowish-green. If some pure yellow specimens be suspended in a glass over a solution of carbonate of ammonia, they become covered with carmine-red globules, after frequent washing entirely lose the usnic acid, and finally become grayish-white like dead lichens. The *Parmelia* and *Usnia* continue of a brilliant green colour in shady and moist places, but when exposed to the heat of the sun they become brownish-black; if treated as above with ammonia and dried, they likewise present similar colours. The fruit-dises of the *Cladonia* also turn brown under similar treatment. The cause of all these changes is the usnic acid, which itself is of a yellow colour, but becomes oxidized in combination with bases by exposure to the air, forming various coloured compounds. *Chem. Ann.* 1844. 157.

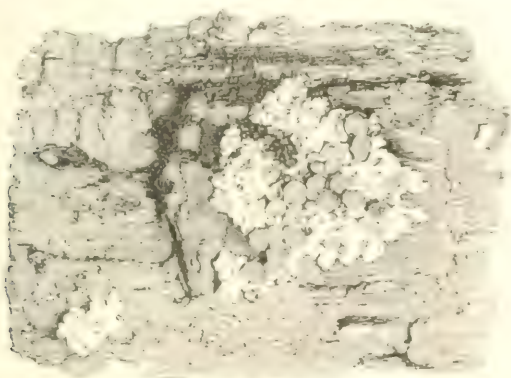


FIG. XXXIII\*.

In this, as in the Fungal alliance, I have forbore formally to break up *Lichenes* into several Natural orders, and have preferred to leave the task to others more skilled than myself in this branch of Botany; but it is not to be doubted, that hereafter the pro-

Mr. Berkeley is not averse to this radiation. The *Collema* *Sarcocolla* the *Cladonia* are *Agar*, and the fruit of a Lichen. The following genera are comprised by the genus—

<i>Collema</i> , Ach.	<i>Synalaxis</i> , Fr.	<i>Oxypeltis</i> , Ach.	<i>Lecidea</i> , Ach.
<i>Leptogium</i> , Fr.	<i>Myxopuntia</i> , Mont. et Des.	<i>Parmelia</i> , Fr.	<i>Massaria</i> , Mont. et Des.

It is better for the present, in a matter confessedly so difficult to settle, and the more so the more, if the task of a hint, rather than to propose a distinct natural system. For many things seem to indicate the necessity of placing them apart under some kind of decomposition.

Fig. XXXIII\*—*Parmelia fraxinea*.



priety of carrying out the principles of ordinal division recognised elsewhere, will be introduced among Lichens. In the meanwhile the evidence that has been collected seems to point to such a mode of grouping as is indicated in the following proposed

## NATURAL ORDERS OF LICHENALS.

<i>Nucleus breaking up into naked spores</i> . . . . .	12. GRAPHIDACEÆ.
<i>Nucleus bearing asci; thallus homogeneous, gelatinous or cartilaginous</i> . . . . .	13. COLLEMACEÆ.
<i>Nucleus bearing asci; thallus heterogeneous, pulverulent or cellular</i> . . . . .	14. PARMELIACEÆ.

## GENERA.\*

I.— <i>Coniothalamaceæ</i> . Shields open; the nucleus breaking up into naked spores. * <i>Pulverariidæ</i> . <i>Arthonia</i> , Ach. <i>Inciliaria</i> , Fr. <i>Arthonaria</i> , Fr. <i>Pulveraria</i> , Ach. <i>Asporium</i> , Achar. <i>Pulcar</i> , Adans. <i>Phycium</i> , Bory. <i>Leptocarpus</i> , Ratn.	<i>Sarcographa</i> , Fée. <i>Asterisca</i> , Meyer. <i>Chiodecton</i> , Ach. <i>Glyphis</i> , Ach.	<i>Ophthalmodium</i> , Eschw. <i>Ocellularia</i> , Meyer.	<i>Pyxidaria</i> , Bory. <i>Pycnothelia</i> , Achar.
	*** <i>Limboriidæ</i> . <i>Urecolaria</i> , Ach. <i>Plagiotrema</i> , Clement. <i>Thelotrema</i> , Ach. <i>Limboria</i> , Ach. <i>Antheocarpum</i> , Meyer. <i>Pyrenula</i> , Fée. <i>Leptocarpus</i> , Fée. <i>Limboria</i> , Ach. <i>Gyrostomum</i> , Fr. <i>Clostomum</i> , Fr.	*** <i>Endocarpidæ</i> . <i>Pertusaria</i> , DC. <i>Porina</i> , Ach. <i>Porophora</i> , Meyer. <i>Sagedia</i> , Ach. <i>Stigmatidium</i> , Meyer. <i>Enterographa</i> , Fée. <i>Endocarpum</i> , Hedw. <i>Urecolaria</i> , Eschw. *** <i>Sphaerophoridæ</i> . <i>Siphula</i> , Fr. <i>Urecolaria</i> , Ach. <i>Sphaerophoron</i> , Pers. <i>Coralloides</i> , Hoffm.	<i>Stereocaulon</i> , Schreb. <i>Thamnum</i> , Vent. *** <i>Parmeliadæ</i> . <i>Gyalecta</i> , Ach. <i>Dirina</i> , Fr. <i>Cilicia</i> . <i>Ctenogium</i> . <i>Parmelia</i> , Fr. <i>Levanora</i> , Achar. <i>Squamaria</i> , DC. <i>Urecolaria</i> , Fr. <i>Phlyctis</i> , Wallr. <i>Patellaria</i> , Fr. <i>Psora</i> , Fr. <i>Placodium</i> , Fr. <i>Zeora</i> , Fr. <i>Amphiloma</i> , Fr. <i>Panaria</i> , Delis. <i>Lobaria</i> , Hoffm. <i>Physcia</i> , Fr. <i>Hagenia</i> , Eschw. <i>Imbricaria</i> , Fr. <i>Platismia</i> , Hoffm.
II.— <i>Ulothalamaceæ</i> . Shields closed at first, afterwards open; the nucleus gelatinous, made up of naked spores. * <i>Graphidæ</i> . <i>Coniangium</i> , Fr. <i>Ustalia</i> , Fr. <i>Pyrenocarpus</i> , Eschw. <i>Platycarpus</i> , Meyer. <i>Sclerophyton</i> , Eschw. <i>Lecanactis</i> , Eschw. <i>Leccanactis</i> , Rehb. <i>Opegrapha</i> , Pers. <i>Hysterium</i> , Ach. <i>Opegrapha</i> , Eschw. <i>Scaphia</i> , Eschw. <i>Leccanactis</i> , Meyer. <i>Graphis</i> , Eschw. <i>Pyrenocarpus</i> , Fée. <i>Graphis</i> , Fr. <i>Leccanactis</i> , Eschw. <i>Platygramma</i> , Meyer.	**** <i>Pyxinidæ</i> . <i>Umbilicaria</i> , Hoffm. <i>Lecanactis</i> , Merat. <i>Gyrophora</i> , Achar. <i>Gyromitra</i> , Wahlenb. <i>Capnia</i> , Vent. <i>Pyxine</i> , Fr.	IV.— <i>Hymenothalamaceæ</i> . Shields open; nucleus forming a disk, permanent and bearing asci. * <i>Ephebidæ</i> . <i>Micarea</i> , Fr. <i>Ephebe</i> , Fr. <i>Coenogonium</i> , Ehrenb. ** <i>Lecideidæ</i> . <i>Lecidea</i> , Ach. <i>Catillaria</i> , Achar. <i>Echinoplaea</i> , Fée. <i>Myriotrema</i> , Fée. <i>Urecolaria</i> , Ramond. <i>Patellaria</i> , Pers. <i>Biatra</i> , Fr. <i>Lepidoma</i> , Ach. <i>Psora</i> , Hoffm. <i>Circinaria</i> , Fée. <i>Urecolaria</i> , Willd. <i>Verrucaria</i> , Hoffm. <i>Sphaerocarpus</i> , Nees. <i>Baeomyces</i> , Pers. <i>Sphyradium</i> , Flot. <i>Cladonia</i> , Hoffm. <i>Cynomyces</i> , Achar. <i>Capitularia</i> , Flörk. <i>Scyphophorus</i> , DC. <i>Urecolaria</i> , DC. <i>Cladonia</i> , Ach. <i>Schismaria</i> , Ach. <i>Cornelia</i> , Ach. <i>Pyxidium</i> , Schreb.	<i>Sticta</i> , Schreb. <i>Pulmonaria</i> , Hoffm. <i>Reticularia</i> , Baumg. <i>Crocodia</i> , Link. <i>Plectocarpum</i> , Fée. <i>Peltigera</i> , Willd. <i>Peltidea</i> , Ach. <i>Antilyssus</i> , Hall. <i>Erioderma</i> , Fée. <i>Solorina</i> , Ach. <i>Somme-feltia</i> , Flörk. <i>Nephroma</i> , Achar. **** <i>Usneidæ</i> . <i>Cetraria</i> , Ach. <i>Physcia</i> , DC. <i>Cornicularia</i> , Hoffm. <i>Crocodactylon</i> , Link. <i>Rocella</i> , DC. <i>Ramalina</i> , Achar. <i>Platyphyllum</i> , Vent. <i>Evernia</i> , Ach. <i>Borreria</i> , Ach. <i>Bryopogon</i> , Lk. <i>Neurospora</i> , Nees. <i>Usnea</i> , Hoffm. <i>Reichenbachia</i> , Spr.
* <i>Glyphidæ</i> . <i>Medusula</i> , Eschew.	*** <i>Verrucariidæ</i> . <i>Diorygia</i> , Eschw. <i>Pyrenotheca</i> , Fr. <i>Leptocarpus</i> , Dufour. <i>Theridion</i> , Wallr. <i>Gyromitra</i> , Flörk. <i>Pyrenocarpus</i> , Eschw. <i>Pyrenocarpus</i> , Fée. <i>Verrucaria</i> , Pers.	*** <i>Trypethelidæ</i> . <i>Sphaeromphale</i> , Rehb. <i>Sagittaria</i> , Fr. <i>Sagittaria</i> , Fr. <i>Mycoporum</i> , Meyer. <i>Pyrenocarpus</i> , Eschw. <i>Pyrenocarpus</i> , Fr. <i>Astrothelium</i> , Eschw. <i>Triptelium</i> , Spr. <i>Urecolaria</i> , Ach.	

NUMBERS. GEN. 58. Sp. 2400. (Fée.)

POSITION.—Marchantiaceæ.—LICHENALES.—Fungales.

\* Arranged principally according to Endlicher.



## APPENDIX

*Tables:* Murrey, J. and Lewis, J. H. (1987) *Chlorophyll and Phaeophytin in Lakes Erie and Ontario*. *Limnology and Oceanography* 32: 1152. *http://www.limnology.org/limnology/1987/32/1152/*

M. Takahara, in the beautiful account above quoted, has demonstrated the presence universally in fishes of ctenophores, or, as he expresses them, ctenophores, and minute minute bodies analogous to the anthozooids of *Ctenophora*, the minute and minute Thaliaceans, but not ctenophores, and therefore distinguished under the name of ctenophores. The following is a brief abstract of the conclusions of this interesting research:



Fig. 10-11118.

The conceptacles of lichens are those minute dark spots, or dots, which are familiar to the students of such plants, and which Hedwig long ago supposed to be male organs. In *Parmelia tiliacea* they are particularly easy to discern as the first of black points scattered, or more frequently collected in groups, on the lower surface of the thallus; their section presents a dark greyish very hyaline central tissue. Their cavity is simple, opening by an imperceptible pore on the surface of the thallus. They are lined by an infinite multitude of little articulated laminae, which converge towards the summit of the organ, and produce, each at its extremity, setiform spermata. The latter are straight, and some which were measured when still adhering to the cell that bore them were found to be from  $\frac{1}{100}$ th to  $\frac{1}{50}$ th of a millimètre in length: it is probable, however, that these eventually separated into two, for when free these spermata are scarcely more than from  $\frac{1}{200}$ th to  $\frac{1}{100}$ th of a millimètre long. When the spermo-cyte is full grown, and filled with spermata, we were so hard that it may be picked out of the thallus with the point of a needle. This organ has nothing to do with producing spores, as M. Rivière has assumed.

The last named observer gives the following account of what he supposes to be the fructification of Lichens. He describes them as either hermaphrodite, or dioecious. In the two former cases there is a prothallus and a thallus, or the latter an hypothallus. The prothallus is the first stage of development, arising from the germination of perfect or imperfect spores. Upon this is raised either a male or female stratum. In dioecious Lichens, such as *Cladonia*, *Pyrenopeziza*, *Scutaria*, *Wetmorea*, *anthridia*, with imperfect spores (androspores) are produced on a barren stratum resembling apothecia. When, however, both sexes are united in the prothallus, a thallus arises, which consists of two principal strata, the lower which is composed of the radiated stratum and the filamentous one above it, the tips of whose branches produce the male gonidia; and the female composed of the gonidia which give rise to the female gonidia, and the corticel. All these are present only in the most perfect Lichens. The goniate stratum is never absent; any of the others may occasionally be deficient. In the hermaphrodite Lichens, the male gonidia are not larger than the female, and greenish yellow; whereas in the dioecious species, they are of the

Fig. XXXIII.\*\*—Perpendicular section of the spermatheca of *Urechis caupo* showing its spermatheca; 2, the cells which generate the sperm. At the bottom of the spermatheca.



same size and colour. Threads from the two strata, proceeding in opposite directions, penetrate each other. The apothecia consist of two principal parts, the one seated above the other; the lower wall gives off threads which our author calls prosphysses, the tips of which bear cylindrical cells, endowed with spontaneous motion, sometimes growing singly, sometimes forming short chains, which are either terminal or lateral. The upper surface, or hymenium, produces the female prosphysses directed downwards, while an intermediate stratum, seated just above the point of production of the androspores, consists of a quantity of female gonidia, from whence proceed the asci and paraphyses. In the diœcious species the male apothecia are distinct, and the individuals which produce them are described under the names of *Pyrenotheca*, *Cliostomum*, &c.

After the far more careful and extended observations of Tulasne, there can be little doubt that the principal part of these speculations is founded in error.

The spermogones, M. Tulasne states, vary somewhat in structure, but they are all formed essentially upon the plan above described. They are mostly plunged in the substance of the Lichen, but are occasionally superficial like the shields of gymnocarpous Lichens, as in *Cetrarias*, *Cladonias*, &c. In form they are generally globular, elliptical, or irregularly oblong; sometimes with a sinuous outline. The shell, usually hard and crustaceous, varies much in thickness; it is often black, or dark coloured, especially towards the summit of the spermogone; in other cases it is so pale as to be lost among the surrounding tissue. Its cavity may be simple, undivided, or multiple and divided in different ways into a variable number either of separate pockets or of narrow sinuosities, all communicating with a common aperture. The tissue which fills the spermogones is very greedy of water.

The spermatia are in all cases terminal or acrogenous with respect to the part which bears them. They are usually linear bodies of excessive tenuity, very short or somewhat long, straight or curved, destitute of appendages, motionless, and united to a mucilage the presence of which is concealed by its extreme transparency. Iodine colours them brown; liquid ammonia appears not to exercise any influence over them. They would be truly analogous to the antherozoids of *Callithamnium* and other Sea-weeds, if they were not born naked instead of developing in a spiral cell. M. Tulasne sees no objection to their performing the same function.

Remarks to the same effect have been made by M. Bornet upon the common *Ephebe pubescens*, referred by one author to Algae, and by another to Lichens. He finds spermogones in this plant, abundantly, in little spheroidal swellings of the branches of the thallus; and in fusiform swellings of the same nature immersed apothecia; the latter being confined to one individual, and the spermogones to another, this author, adopting the hypothesis of sexuality among Lichens, regards *Ephebe pubescens* as being diœcious. *Ann. sc., ser. 3, xviii. 155.*

With regard to the shields, or apothecia, the substance of M. Tulasne's observations may be stated succinctly as follows. The hymenial tissue which invests the disk of the open shield of *Parmelia* and similar Lichens rests on a layer of very fine cells, whose structure is usually less regular than that of the epidermal layer. This layer proceeds from the filamentous matter of the medulla, or rests immediately upon it.

—The disk of the shield consists entirely of paraphyses and thecæ mixed together, placed vertically on the tissue from which they rise, as in the hymenium of thecaporous Fungi. These two parts hold together with such tenacity, that they can hardly be dissociated without the aid of chemical reagents.—In *Parmelia parietina* tincture of iodine, employed by itself, colours deep blue the amorphous sub-hymenial tissue, the membrane of the thecæ, and the paraphyses, with the exception of the terminal cells of the latter, which preserve their natural yellow colour, almost without alteration. The addition of sulphuric acid after iodine has no effect upon the yellow part. These seem to be general facts, to which however there are some exceptions.

—The paraphyses are certainly jointed, not simple as Meisner supposes. They are not abortive thecæ, but bodies formed of lines of cells, of which the upper are short and coloured. In order to see this fact distinctly, it is indispensable that the compact elements of the shield should be disaggregated by some acid. The thick-sided condition of the thecæ is part of their proper nature, and is not caused by the secretion of intercellular matter, as has been said.—Acids also show that the thecæ are really bodies attached to a parent cell by a point at the base, but are otherwise free, however much they may be glued to the adjoining parts. Without the assistance of acids, this is not to be seen.—The theory of Schleiden that the thecæ and paraphyses are the terminations of the branches of a filamentous underlying structure is inadmissible.—The spores contained in the spore-cases or thecæ of Lichens are much like those of Fungi, except that the former are very seldom spiny or warted. It is in fact only in *Solorina saccata* and *Thelotrema exanthematicum* that M. Tulasne has seen such



a structure; in the former, the surface of the spores is granular, as the latter it is barely, with extremely fine transparent distant points. The contents of the spores usually consist of mucous granular matter which, when washed deeply yellowish-brown. Their shell is thin and unaffected by limes, even after having been treated with sulphuric acid, which distends it without dissolving it, unless the acid is very intensely treated. — The largest spores seen by M. Tulasne among European lichens, except the *Peridermium* continues, where they are  $\frac{1}{16}$  to  $\frac{1}{8}$  of a millimetre long, by the  $\frac{1}{16}$  or  $\frac{1}{8}$  of a millimetre broad, only two or three of them are usually present in each thallus. Such is the size of these spores, that when scattered on a slip of glass, &c., they are visible to the naked eye, and may even be counted. See the *Annuaire* (above quoted), and the *Annales des Sciences*, ser. 3, vol. xiii., 1852.

To the species of *Lichens* possessing nutritive qualities have to be added the *Lichens* esculenta and affinis, which sometimes appear abundantly in heathen countries in Persia, Armenia, and Tartary, where they are eagerly devoured by the natives, who

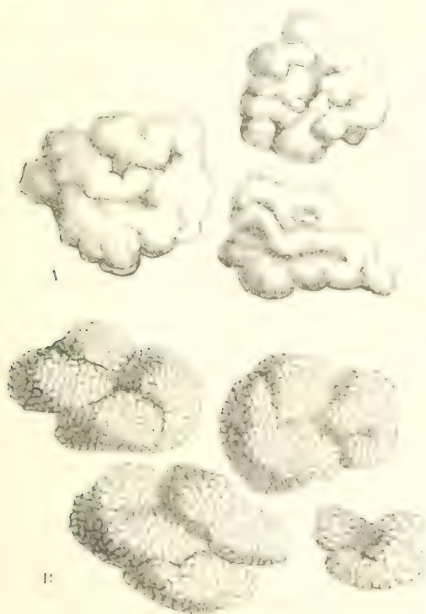


Fig. XXXIII.

fancy that they must fall from Heaven, not knowing how else to account for the prodigious numbers of these plants, of the origin of which they are ignorant. Parrot says that in some districts in Persia they cover the ground to the depth of five or six inches. Eversmann, who had an opportunity of studying the species on the rivers Emba and Jaik, and also near Lake Aral, was surprised that even in the earliest stage of growth, the plants have not the slightest attachment to the grain of sand, but that their thallus is developed freely, as was at first noticed by Tulasne. A species or variety has lately been found in large quantities in Arizona, and Treviranus informs us that specimens were found to have descended from the clouds at Mount Ararat exist in the Museum of Natural History in the Arminian Church of S. Lazzaro, in an island of that name near Venice. The common production in question is eaten both by men and animals in the several countries extending from Algiers to Tartary, where it is produced. The sheep, however, which feed upon it in Algiers do not thrive, in consequence, it is supposed, of the large amount of oxalate of lime which it contains, amounting to Gmelin's analysis to contain 66 per cent. The individual plants which grow from a few grains to two scruples or upwards, even when dry, and when swollen with moisture nearly twice as much,



Palas mentions another Lichen which is eaten by the Kirghiz Tartars, under the name of Earth-bread. This, however, has a very different habit, covering the surface of the steppes with a whitish grey crust and breaking into many fragments when the soil is dry. It appears to be eaten only in cases of extreme necessity, and is constantly accompanied by the common *Nostoc*.—*Berkeley in Gardeners' Chronicle*, 1849, p. 611.

Tulasne has made the curious observation that some of the species of this order are true parasites upon other Lichens.

#### ADDITIONAL GENERA, &c.

<i>Byssophytum</i> , <i>Montagne</i> , near <i>Spiloma</i> .	<i>Ascidium</i> , <i>Fée</i> , near <i>The- lotrema</i> .	<i>Myriangium</i> , <i>Berkeley</i> , near <i>Collema</i> .	PARASITES. <i>Abrothallus</i> , <i>DeNotaris</i> . <i>Scutula</i> , <i>Tulasne</i> . <i>Celidium</i> , <i>Tulasne</i> . <i>Phacopsis</i> , <i>Tulasne</i> .
<i>Thysanothecium</i> , <i>Mont. &amp; Berk.</i> near <i>Stereocaulon</i> .	<i>Acroscyphus</i> , <i>Leveillé</i> , near <i>Sphaerophoron</i> .	<i>Parishia</i> , <i>Décaisne</i> = <i>Paulia</i> .	

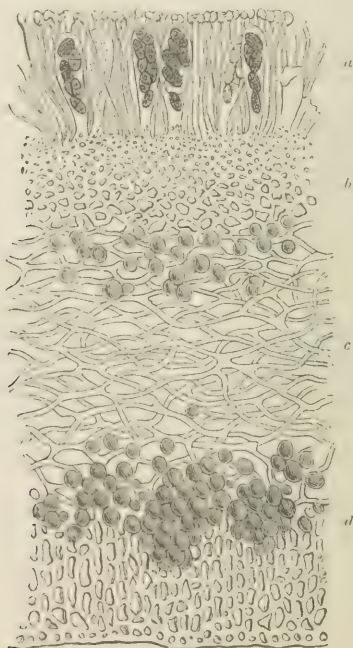


Fig. XXXIII.\*\*\*\*

Fig. XXXIII.\*\*\*\*—A greatly magnified view of a perpendicular section of *Parmelia aipolia*, shewing the thence in the shield, *a*; *b*, the hypothecium and some gonidia beneath it; *c*, the medullary region; and *d*, the gonimic layer—after *Tulasne*.



## CLASS II. ACROGENS.

PSYCHROTYLEDONÆ, *Auct. H.* Art. 72 (1821). — HEDENSTROMA, *Fides, Syst. Gen.* Vol. 1. 36. 1831.  
 ACROGENA, *Müll. in Mont. Ph. Crypt.* p. 69, *Engelm. Gen.* p. 32. 1847. — Auct. 54.  
 AC. *Botanica Russica* p. 110. (1843).

With this class a great advance in structure is accomplished. The simplicity which is so remarkable in Thallogens is exchanged for a complicated apparatus of many kinds. All the species have stomates or breathing-pores on their surface: in the great majority there is a distinct stem and leaves, the latter of which are always arranged with perfect symmetry; and in those species which approach Thallogens, (as the Crystalworts, which stand close upon Lichens) the thallus has all the texture of leaves, although a separate stem is refused to them. There is, however, no trace of flowers, properly so called; and yet in the involucre of many Liverworts, and in the spore-cases of Mosses, an arrangement of leaves occurs, which appears to be the forerunner of the flowers of more perfect plants. Sexes, however, are wholly missing; that is to say, nothing can be found which resembles the anthers and pistil of flowering plants, except in some very-external circumstance: we want satisfactory evidence that any order of Acrogens possesses organs which require to be fertilised the one by the other in order to effect the generation of seeds. Hence those reproductive bodies of Acrogens which are analogous to seeds are called spores. Mr. Griffith takes, however, a very different view of this question, and assigns true sexes to Acrogens.

He thinks it probable that we have at least three modifications of the phenomenon of fecundation "among the higher acotyledonous plants. In one the male influence is applied to the apex of a pistillum, in the second to a nucleus without the intervention of a pistillary apparatus. In the third the male influence is exerted on a frond itself, and is followed by the development of the young capsule from a point in the substance of the frond corresponding to and sometimes distant from the place to which the male influence has been applied. This is founded on observations made on *Anthoceros* in 1836, from which it would appear that the place of exertion of the future capsules is pointed out by a slight protuberance, over the apex of which a flake of matter like the so called male matter of *Musci* and *Salvinia* is spread, sending down to some distance within the frond a tube-like process, which causes the dislocation of the cells of the tissue with which it comes into contact. The future capsule is stated in *loc. cit.* not to be appreciably pre-existent, and its situation is only pointed out by a bulbiform condensation of the tissue of the frond. The young capsule during its development ascends along the same line, and pushes before it a corresponding cylindrical body of the tissue of the frond, the *calyptra* of authors." But, it seems to me, that this very complexity of action is more like variations in self-propagation, than phenomena of fecundation, which among the plants in which that action certainly takes place, is subject to no such modifications.

A large number of Acrogens have no true spiral vessels, which are confined to the more highly developed forms, such as *Ferns*, *Ulknesses*, and *Horsetails*; but there is a very general tendency in the production of spiral



threads in their cells. This has been long known to exist in the bodies called elaters among Liverworts, and traces of it have been recognised in the leaves of certain mosses, such as *Sphagnum*.

"So far as I am aware," says Schleiden, "the occurrence of a spiral formation has been observed in the reproductive organs of *Hepaticæ* only in the elaters or fruit-valves. But it is not less strikingly developed in the organs of vegetation in *Marchantiaceæ*. The parenchyma of the leaf of *Marchantia polymorpha* and *Fegatella conica* consists almost entirely of cells whose partitions appear distinctly porous, or (especially in *M. polymorpha*) beautifully thickened with net-work. This thickening of the partitions of the cell takes place to so great a degree in the older parts and in the proximity of the midrib, that by transverse sections the pore-channels may be plainly recognised. Amongst mosses, the true *Dicrana*, for example *D. Schraderi*, *spurium*, &c., are distinguished by the cells of the leaf having very thick sides, and their partitions evidently pierced by very wide, or funnel-shaped pore-channels, just as happens in the epidermis of many phanerogamous plants; and still more conspicuously do these spiral and porous formations display themselves in *Sphagneæ*, and in the nearly related group of *Leucophaneæ* established by Hampe."—(*Ann. Nat. Hist.* v. 73.) The same tendency is still more remarkably apparent in a curious formation of loose short spiral threads generated in the cells of the bodies called *Antheridia*, and elsewhere; which, because of an apparently spontaneous motion when they are floating in water, have been thought to be animalcules of the genera *Spirillum* or *Vibrio*.

In general, *Acrogens* are plants of very small stature. But in Ferns they occasionally acquire the size of trees; always however growing with a simple stem in such cases, unless when their growth is interrupted by accident. If they branch naturally, they do so in a forking manner. Their stem, instead of increasing by the deposition of matter originating in the leaves, appears to be a mere extension of one common vegetating point, which becomes cylindrical and long, when it is capable of being acted upon by the influence of light. It may be regarded indeed as a mere combination of the bases of leaves, gradually evolved one from the bosom of the other.

The orders of *Acrogens* seem to resolve themselves into three Alliances, of which the lowest in organization in some respects is the highest in others. This which is named the Muscal, inasmuch as it includes the true Mosses, has no spiral vessels, no veins to its leaves, and its species are of diminutive size; but it has reproductive organs of two very distinct kinds, and its spore-cases are usually elaborately provided with elaters at least, and often with a complicated arrangement of rudimentary leaves. The two others have a far larger stature, are abundantly furnished with scalariform or true spiral vessels in their stem, but their reproductive organs are of the most simple kind, and never assume different forms in the same individual. The one called the Lycopodal Alliance has scaly leaves and pulverulent spores, always of two sorts, contained in cases which usually open by definite valves; the other, called the Filical Alliance, has thin expanded veiny leaves and granular spores of only one kind enclosed in cases which burst irregularly.

The affinities of *Acrogens* are well ascertained. *Riccia* and its neighbours are closely allied to Lichens. Horsetails may be looked upon as an approach towards the structure of *Ephedra* among *Gnetaceæ*, or of *Casuarina* in *Galeworts*. The Clubmosses evidently approach *Coniferous Gymnogens* in their small scale-like imbricated leaves and coniferous fructification.



Ferns themselves have in their foliage the peculiar venning of certain genera belonging to the order of Yews in Gymnogens; they also approach Cycadaceæ in Gymnogens in their simple cylindrical stems and pinnate foliage, which bears the fructification on the margin. Nor are the Liver Mosses (*Hepaticæ*) without their resemblance to the order of Yews when we compare some of the larger species with the little *Daerydia* of New Zealand, which are only a few inches high.

#### ALLIANCES OF ACROGENS.

**MUSCALES.**—*Cellular (or vascular). Spore-cases immersed or subperigæ (i. e. either plunged in the substance of the frond, or enclosed within a hood having the same relation to the spores as an involucre to a seed-vessel.)*

**LYCOPODALES.**—*Vascular. Spore-cases axillary or radical, one or many celled. Spores of two sorts.*

**FILICIALES.**—*Vascular. Spore-cases marginal or dorsal, one-celled, usually surrounded by an elastic ring. Spores of but one sort.*

The foregoing statement respecting the reproductive organs of Acrogens represents what appeared to be, in 1845, the amount of positive knowledge that botanists had acquired upon that subject. Since then, numerous microscopic observers have occupied themselves with a search for what are supposed to be the equivalents of sexes in the higher orders of plants, and Mr. Hentfrey has ably condensed their views in a Report to the British Association for the Advancement of Science, read at their meeting in 1851. The general result is that organs analogous to the sporogones of Lichens, and the conceptacles of Algae, have been found everywhere, and the general fact that Acrogens, in addition to their spores, are furnished with moving spiral filaments or antherozoids is placed beyond a doubt. It must also be admitted that there is some circumstantial evidence to show that the antherozoids are intended to replace the pollen grains of flowering plants; but at present there is no direct proof of the fact. Since Mr. Hentfrey's report, above alluded to, is that of a good and conscientious observer, who has himself studied the subject, the additional observations introduced into this edition are borrowed largely from the report above alluded to.

He observes that, in regard to the existence of two sexes, and the necessity of a process of fertilisation, we have several kinds of evidence.

"1. The inferences to be deduced from the universality of the existence of two kinds of organs in connexion with the reproductive process. We have seen that these exist in all the families at some period or other of the life of the reproductive of the species. In the Mosses and the Hepaticæ they occur in the fully developed plant. In the Ferns and the Equisetaceæ, they occur upon cellular stems of a frondose character, developed from all the spores, which frondose bodies or proembryoes have an existence of some permanence, especially in the Equisetaceæ. In the Lycopodiaceæ, the Isoetaceæ, and Rhizocarpeæ, the prothallia occur upon very transitory cellular structures produced from one kind of spore, the larger, while the smaller spores at once develop in their interior cells, containing moving spiral filaments such as occur in the antheridia of the other families.

"2. The inferences to be deduced from the observations on the development of those plants in which the two kinds of organs, occurring in distinct plants, can be separated. Strong evidence has been brought forward that the Liver Mosses, as they are called, do not produce sporangia when the prothallia are kept apart from the antheridia by natural accident. The majority of observers state that the large spores of the Rhizocarpeæ do not germinate if the small spores are not removed from contact with them; a few counter-statements, however, do exist. Again, the majority of authors, and all the recent ones, state that only the large spores of the Lycopodiaceæ and Isoetaceæ produce new plants; while some others writers believed that they had seen the small spores do so.



"3. The direct observation of a process of fertilisation, of which we have only testimony from two authors, Suminski and Mercklin, in reference to the Ferns alone; since the assertions of Schleiden in regard to the Rhizocarpeæ have been demonstrated by Nageli, Hofmeister, and Mettenius, to have been based on very imperfect observation.

"The circumstantial evidence furnished under the first head seems to me very strong—so much so that I am inclined to adopt the idea of sexuality on this ground, as the legitimate provisional hypothesis arising out of our present knowledge, especially when supported so strongly as it is by the negative evidence indicated under the second head.

"The positive evidence of the third head is certainly very insufficient as yet, considering the extreme delicacy of the investigation. Suminski's other observations on the details have been contested in many particulars; and Mercklin, the only other observer who asserts that he has seen the spiral filaments within the so-called ovules, describes the conditions differently, and states that he has only been able to observe them positively there three times. At the same time the difficulty of the investigation should make us hesitate in attaching too much weight to the failure of the other observers in tracing a process of fertilisation; moreover, it is quite possible that actual entry of the spiral filaments into the canal of the ovules or pistillidia is not always, if ever, necessary.

"The facts before us, then, appear to me strong enough to warrant the adoption of the views propounded by the latest authors on this subject, and the acceptance of the hypothesis of sexuality in the vascular Cryptogams as the most satisfactory explanation of the phenomena as yet observed. The question lies now much in the same condition as that of the sexuality of flowering plants before the actual contact of the pollen-tubes with the ovules had been satisfactorily demonstrated.

"Further arguments may be adduced from grounds lying out of the preceding statements, viz., 1. The late discovery of two forms of organs in the Alge, Lichens, and Fungi, which, although imperfect at present, lead to the expectation that the analogues of the antheridia and pistillidia of the Mosses, so long known, will be found in all Cryptogamous plants. 2. The analogies between the processes of animal and vegetable reproduction which appear to be offered by these new views of the nature of the phenomena in the vascular Cryptogams. To this last argument I shall merely allude, as it may be considered to lie beyond the special province of the vegetable physiologist; yet when we recollect the imperceptible character of the gradations of the lower forms of the two kingdoms, there seems far sounder ground than is allowed by Schleiden for arguing from apparent analogies between the phenomena occurring in the two great kingdoms of nature.

"Under the second point of view mentioned above, the facts of structure may soon be disposed of, so far as the analogies of form are concerned; the antheridia of the Mosses, Hepaticæ, Ferns, and Equisetacæ, agree with the small spores of Isoëtæ, Selaginella, Pilularia, and Salvinia, in producing the cellules in which are developed the moving spiral filaments which constitute the essential character of the organs of the one kind; while the pistillidia of the Mosses and Hepaticæ agree with the so-called 'ovules' of the Ferns, Equisetaceæ, Lycopodiaceæ, Isoëtaceæ, and Rhizocarpeæ, in general structure, and in the presence of the central large cell from which the new form of structure originates.

"The great differences depend on the position in time and space of the organs, in the different classes, and the nature of the immediate product of the so-called 'embryosac,' the large central cell of the pistillidia and 'ovules.'

"In the Mosses and Hepaticæ the pistillidia occur upon the plant when the vegetative structure is perfect,—and the immediate product of the great cell is a sporangium. If a process of fertilisation take place here, we may regard the antheridia and pistillidia as analogues of the anthers and pistils of flowering plants, the sporangia of their fruits; or, with Hofmeister, we may regard the phenomenon as an instance of an 'alternation of generations,' where the pistillidium would be looked upon as an ovule, producing (in the sporangium) a new individual of totally different character from that developed from the spore (the leafy Moss plant in the usual acceptance of the term).

"In the Ferns and Equisetacæ, we find the spores producing a frondose structure of definite form, upon which are developed antheridia and pistillidia, or 'ovules.' Here then we seem to have one generation complete, and the new development from the pistillidium or 'ovule' appears in a totally new form, producing stem and leaves which have a distinct individual form and existence, and produce the spores after a long period upon temporary parts of the structure, on the leaves; and by no means cease to exist when those are matured. Here we seem to have a real 'alternation



of generations; and Hofmeister compares the whole permanent plant of the Fern or Equisetum to the sporangium of the Mosses and Hepaticæ. In all the other families, the Lycopodiaceæ, Isoëtaceæ, the Rhizocarpeæ, the procembryo is a very transient production, and is developed from a different spore from the actual spore. This procembryo is clearly analogous to that of the Ferns and Equisetaceæ; and if the existence of sexes be a fact, we have here a distinct condition as contrasted with a monocious condition in the two last named families. Hofmeister here accordingly states that the procembryo developed from the large spore is an intermediate production between the two perfect forms of the plant.

"It is rather difficult to decide upon the real analogies of these structures with those of the flowering plants. The resemblance of structure is in close between the pistillidium of the Mosses and Hepaticæ, and the 'ovule' of the other vascular Cryptogams; that they must be regarded as analogues, and then the former could not well be considered to be analogous to the pistils of flowering plants, but rather to ovules: if this be the case, the sporangium must be considered the analogue of the perfect plant in the Fern, &c., and the leafy stem as the analogue of the procembryo of the Fern, &c. The pistillidium of the Mosses can, indeed, hardly be regarded as analogous to the fruit of a flowering plant, as in that case the spores would be ovules produced long after fertilisation; and, on the other hand, if we consider the pistillidium of the Moss as an ovule, which it might be, analogous to that of the Coniferæ—in which a large number of embryonal vesicles or rudiments of embryos are produced after fertilisation on the branched extremities of the suspensors, then we seem to lose the analogy between the product of the pistillidium of the Moss and that of the ovule of the Fern, unless we would regard the entire plant of a perfect Fern as analogous to the ovule of a Conifer.

"Perhaps the time has hardly come for us to arrive at any conclusion on these points. The phenomena in the Ferns and Equisetaceæ, as well as in the Rhizocarpeæ, Lycopodiaceæ, and Isoëtaceæ less strikingly, seem to present a series of conditions analogous to those which have been described under the name of 'alternation of generations' in the animal kingdom; and seeing the resemblance which the pistillidium of the Mosses have to the ovules of the other families, we can hardly help extending the same views to them: in which case we should have the remarkable phenomenon of a compound organism, in which a new individual forming a second generation developed after a process of fertilisation, remains attached organically to the parent, from which it differs totally in all anatomical and physiological characters. It is almost needless to advert to the essential difference between such a case and that of the occurrence of flower buds and leaf buds on one stem in the Phanerogams, as parts of a single plant, yet possessing a certain amount of independent individuality. These are produced from each other by simple extension, a kind of germination; while the Moss capsule, if the sexual theory be correct, is the result of a true reproductive process."

In a postscript to the above report, Mr. Henfrey makes some further observations; he particularly alludes to a work by Dr. W. Hofmeister upon the higher Cryptogams, which contains an elaborate series of researches upon this subject. He there confirms all his previous statements, and all the essential particulars given by Summifer, Nageli, Mettenius, &c., excepting the facts of the impregnation by means of the sperm filaments or spermatozoids, which however he considers it warrantable to assume.

"The comparison of the course of development of the Mosses and Liverworts on the one hand, with the Ferns, Equisetaceæ, Rhizocarpeæ, and Lycopodiaceæ on the other, reveals the most complete agreement between the development of the fruit of the former and the development of the embryo of the others. The archegonium of the Mosses, the organ within which the rudiment of its fruit is formed, resembles perfectly in structure the archegonium of the Filicoids (in the widest sense, that part of the prothallium in the interior of which the embryo of the frondose plant originates. In the two great groups of the higher Cryptogams, one large central cell, originating free in the archegonium, gives origin by repeated subdivision to the fruit in the Mosses, and to the leafy plant in the Filicoids. In neither of them does the subdivision of this cell go on; in both does the archegonium become destitute of spermatic filaments do not reach it at the epoch when it bursts open at the apex.

"Mosses and Filicoids thus afford one of the most striking examples of a regular alternation of two generations widely different in their organisation. The first of these, produced by the germinating spore, develops antithetically and asexually, sometimes few, sometimes many. In the central cell of the archegonium, in consequence of a fertilisation through the spermatic cells derived from the androecia, becomes developed the second generation, destined to produce spores, which are always formed in a number much greater than that of the rudimentary fruits of the first generation.



"In the Mosses the vegetative life is exclusively committed to the first, the production of fruit to the second generation. Only the leafy stem possesses roots; the spore-producing generation draws its sustenance from the foregoing. The fruit is usually of shorter duration than the leaf-bearing plant. In the Filicoids the opposite condition obtains. It is true the prothallia send out capillary rootlets; those of the Polypodiaceæ and Equisetaceæ under all circumstances, those of the Rhizocarpeæ and Selaginellæ frequently. But the prothallium has a much briefer existence than the frondescent plant, which in most cases must vegetate for several years before it comes to bear fruit. Yet the contrast is not so strong as it appears to be at first sight. The seemingly unlimited duration of the leaf-bearing Moss-plant depends upon constant renovation. Phenomena essentially similar occur in proliferous prothallia of the Polypodiaceæ and Equisetaceæ. The structure of the lowest (*Anthoceros*, *Pellia*) is less complex, and the duration of the fruit-bearing shoots is little longer than that of the fruit itself. On the other hand, the ramification of the prothallium of the Equisetaceæ is exceedingly complicated; its duration is even equal to that of a single shoot.

"It is a circumstance worthy of notice, that in the second generation of Mosses, as of the Filicoids, destined to produce spores, more complex thickenings of the cell-walls regularly occur (teeth of the peristome of Mosses, wall of capsule and elaters of Liverworts, vessels of Filicoids, &c.), while in the first generation, springing from the spores, such structures are found only rarely and as exceptions.

"The manner in which the second generation arises from the first, varies much more in the Filicoids than in the Mosses. The Polypodiaceæ and Equisetaceæ are hermaphrodite; the Rhizocarpeæ and Selaginellæ monœcious. All the Filicoids agree in the fact that the first axis of their embryo possesses but a very limited longitudinal development; that it is an axis of the second rank which breaks through the prothallium and becomes the main axis; further, in the end of the axis of the first rank never becoming elongated in the direction opposite to the summit. All Filicoids are devoid of a tap-root, and possess only adventitious roots.

"In more than one respect does the course of development of the embryo of the Conifers stand intermediately between those of the higher Cryptogams and the Phanerogams. Like the primary parent-cell of the spores of the Rhizocarpeæ and Selaginellæ, the embryo-sac is an axile cell of the shoot, which in the former is converted into a sporangium, in the latter into an ovule. In the Conifers the embryo-sac also very early becomes detached from the cellular tissue surrounding it. The filling-up of the embryo-sac with the albumen may be compared with the origin of the prothallium in the Rhizocarpeæ and Selaginellæ. The structure of the 'corpuscula' bears the most striking resemblance to that of the archegonia of *Salvinia*, still more to that of the Selaginellæ. If we leave out of view the different nature of the impregnation, in the Rhizocarpeæ and Selaginellæ by free-swimming spermatic filaments, in the Conifere by a pollen-tube (which *perhaps* develops spermatic filaments in its interior), the metamorphosis of the embryonal vesicle into the primary parent-cell of the new plant in the Conifers and Filicoids is solely distinguished, by the latter possessing only a single embryonal vesicle which completely fills the cavity of the central cell of the archegonium, while the former exhibits very numerous embryonal vesicles swimming in it, of which only one pressed into the lower end of the 'corpusculum' becomes impregnated. The embryo-sac of the Conifers may be regarded as a spore which remains enclosed in its sporangium; the prothallium which it forms never comes to light. The fertilising matter must make a way for itself through the tissue of the sporangium, to reach the archegonia of this prothallium."

I confess that I am by no means satisfied with some of these opinions. The adoption of Steenstrup's theory of alternate generations seems to arise too much from *à priori* considerations, and the statements regarding the impregnating action of the spiral filaments in Ferns appears to be wholly hypothetical.

Let us take for illustration Hofmeister's account of the development of the organs of Lycopods (*Annales des Sciences*, ser. 3. xviii. 183.) It is only in *Selaginella helvetica*, says this author, that he has been able to make out what happens in the microspores (powdery matter) after they are sown. In the beginning of March he sowed them in earth and sand kept constantly moist. Five months afterwards, he found in each microspore, almost without exception, a great quantity of small spherical vesicles, whose diameter was scarcely equal to  $\frac{1}{1000}$  of a line, and which did not quite fill the cavity in which they were lodged. When these microspores were carefully pressed, the vesicles were easily squeezed out, and there appeared in some of them a very fine spiral thread, or spermatozoid, which, when liberated, stirred with a gentle motion. This is no doubt a remarkable fact; but it stops short of the proof



demanded, that the spiral threads are for the purpose of impregnation: a function which seems the more doubtful when another statement by Hofmeister is compared with their appearance. This ingenious observer expressly declares that the spiral threads were generated about six weeks before he could observe in the peridium of the macrospores (granular matter) found at the same time the first outlines of an archegone. But if the spiral threads were to be present at the archegone, why should be asked, are they not formed so as to be ready to act at the moment when the archegone is prepared to receive them, as occurs between pollen and stigma. If this can be explained, it would next be necessary to enquire—first, what the spiral threads were doing during the six weeks that they lay on the dump and before the archegone was ready; and secondly, by what means these bodies “qui s’agissent d’un mouvement assez lent” contrive to reach the archegones.

It must not however be omitted, that Hofmeister expressly declares that “en deux mes essais de culture, je recouvrais d’une cloche de verre les macrospores et les microspores sèches ensemble, l’expérience n’aboutissant à rien de satisfaisant.—Les seules spores donnant, au contraire, promptement des embryons, quand je place près d’elles, sous la cloche, des individus sèches et non fertiles de l’espèce de *Selaginella* à laquelle ces spores appartenaient.” By which we presume it is intended to say, that although the spiral filaments are behindhand when sown artificially yet they keep time when left upon the plant. But where there is a positive observation on the one hand, and only a conjecture on the other, the former would seem to be the more important of the two.



ALLIANCE IV.—*MUSCALES*.—THE MUSCAL ALLIANCE.

CELLULARES FOLIACEÆ, DC. *Theor. Elem.* 249. (1819).—PSEUDOCOTYLEDONEÆ, Class I. Agardh, *Aph.* 103. (1822).—HETERONEMEA, Fries *Syst. Orb. Veg.* 33. (1825) *in part.*—ACOTYLEDONES, Class 2. Ad. Brongniart in *Dict. Class.* 5. 159. (1824).—CRYPTOGAMICÆ, 2d Circle, T. F. L. Nees v. Esenbeck and Ebermaier *Handb. der Med. Bot.* 1. 18. (1830).—HEPATICÆ and MUSCI, *Endlicher Gen.* 42. and 46.

DIAGNOSIS.—*Cellular or vascular Acrogens, with the spore-cases either plunged in the substance of the frond, or enclosed in a cap-like hood.*

NEXT after the Algal series follows that which derives its name from Mosses, presenting at one point a structure nearly as simple as that of Lichens, and at another a complexity of organization unknown elsewhere among Acrogens. The Crystalworts (Riceiaceæ), by which the series begins, are mere lobes of green or purple parenchyma floating in water or spreading over mud, and multiplied by reproductive particles (spores) generated in hollow flask-like cases. Then follow masses of species gathered together under the names of Liverworts (Marchantiaceæ) and Scalemosses (Jungermanniaceæ), whose stems and leaves are, in the majority of instances distinctly separate, and among whose spores are formed elastic threads with a powerful hygrometric quality and of unknown use. Finally the ranks are closed by Splitmosses (Andræaceæ), and Urn-Mosses (Bryaceæ), which have in all cases a distinct axis of growth, symmetrical leaves, and a complicated reproductive apparatus formed by the adhesion of leaves in rings or whorls: in emulation, as it were, of flowers, in the more completely organized classes of Endogens and Exogens.

In the opinion of a large number of modern observers there are two sexes in all these plants, the one bearing the name of Antheridia (or false anthers), and the other of

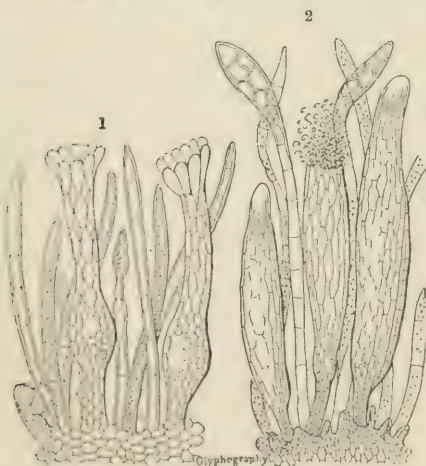


Fig. XXXIV.

factes are masses of pistils. (See his admirable Memoir, tt. vi. et vii.) On the other hand Greville and Arnott, in the fourth volume of the *Transactions of the Wernerian Society*, speak thus positively against the sexuality of the organs in question:—

“What the organs really are, in the plants under review, which the accurate Hedwig so well figured and described under the name of stamens, we leave to others to decide; but we cannot help entering our protest against those bodies called Stamina and Pistilla (the young thereof) being regarded in a similar light with the same organs in more perfect plants. ‘Though,’ says Sprengel, ‘I have formerly been a zealous advocate for Hedwig’s *Theory of the Fructification of Mosses*, it has nevertheless appeared to me an insurmountable objection, that the supposed anther can again produce buds and strike roots; which is certainly the case with regard to the disks of *Polytrichum commune*,

Fig. XXXIV.—1. Young spore-cases and paraphyses of *Polytrichum commune*. 2. Antheridia and paraphyses of *Mnium cuspidatum*. Link.

2  
Pistillidia (or false pistils). That such organs exist is certain; the question is whether or not they are to be looked upon as connected with sexual qualities. Those who regard them in that light have naturally taken the imbedded oblong antheridia of *Marchantia*, and the stalked reticulated ones of *Jungermannia*, for anthers; but Hooker, in his beautiful *Monograph* of the latter genus, and also in his *British Flora*, (p. 459,) is unsatisfied as to their nature. Greville, in the *Flora Edinensis*, is in a similar state of uncertainty; and Agardh admits nothing more in them than a resemblance to male organs, adopting the opinion that they are a particular form of gemmules. Mirbel considers the cups or baskets of *Marchantia* to be filled with little buds, and the peltate receptacles to be male flowers, while the stalked recep-



*Bartramia fontana*, *Bryum palustre*, *undulatum*, *cuspidatum*, *punctatum*, and with some of *Tortula ruralis*. In *Bryum argenteum* we see the seeds containing the immature anthers constantly drop off, strike root, and produce new plants; thus I have often seen myself times out of number. Still more in point is the experiment performed by David Mées, of sowing the stellulae of *Polypodium commune*, containing several undeveloped bodies, when he found that plants came up, which in their turn produced spores. Another excellent naturalist, Dr. Roth, has made similar observations with regard to *Hypnum squarrosum* and *Bryum argenteum*. It is more probable, therefore, that the supposed anthers are mere gemmæ, produced by the superabundance of the juice, and hence surrounded by succulent filaments." Fries also, in his *Phœbe Nomenclæ* (1802), expresses himself thus, "Musci sunt excoalescentes in sterili organa thesaurizantes, quæ post gemmas vix dubium videatur."

Nevertheless, in the face of this evidence, Adolphe Brongniart retains a belief in the sexuality of Mosses, and in the male functions of the axillary bodies; and he says, with justice, that it appears from Brown's mode of describing Mosses, that he continues a similar opinion. Dr. Taylor also thinks that the Liverworts show the presence of two sexes in the most evident manner. (*Linn. Trans.* xvii. 376.) That the flask-like bodies called pistillidia are female organs he considers proved by the germination of the dark brown particles (spores) that are contained within them. He admits that no direct evidence exists to show that the antheridia are male organs; but he says that they discharge a viscid whitish liquor, which is rapidly dissolved in the air, uniformly to concede the pistillidia, and have fulfilled their office before the seeds (spores) are ripe. Dr. Montagne follows on the same side (*Linn. S. Nat.* 2. Ser. ix. 169), with the sweeping assertion that "no body now-a-days, finally denies that Mosses and Liverworts have two sexes." Mr. Valentine, in two elaborate papers (*Linn. Trans.* xvii. 465, and xviii. 409), denies the sexuality of some plants at least of the Muscal Alliance; justly observing, however, that the experiments mentioned by Sprengel and Mées are un satisfactory, there being no proof in them that it was the antheridia which grew; it might have been the whole mass of the stellate disks in which the antheridia occur. Mr. Valentine relies upon the very important fact, first remarked by himself, that the pistillidium, in which the spores are produced, is not in existence at the time when the antheridia are in action. Like Moëll and Agardh, he maintains that the spores, although equivalent to seeds, are almost identical with pollen grains. "The only difference," he adds, "that I can find between pollen and sporules is, that the coat of the latter is of a more rigid and opaque texture. From this difference it is that the sporules mostly burst in a sudden manner upon the application of water; but when they fall, the moving particles are discharged loose in the water, precisely in the same manner as are those of pollen."

Upon this point however Mr. Griffith observes, that "it is to be borne in mind, that whereas pollen is the result of a simple separation constituting a primary and independent process; in Musci, Hepaticæ, Salvinidæ, the spores, otherwise so similar to pollen, are the result of a secondary process, dependent on a primary one, which appears to be remarkably analogous to plerogamic fecundation."

Finally, Unger in his account of the anatomy of *Riccia* (*Linn. S. Nat.* 175), shows that antheridia and pistillidia are alike at first, that the contents of the first are lost, of the second retained, and that the first perishes while the second is permanent. And now it is reasonable to presume that the emission from the antheridia is a secondary condition for the formation of spores. He therefore regards them as male and female.

It seems clear from all these statements, that the question of sex in the Muscal Alliance is undecided. There is no doubt that two very different sexes if not several among its species; but it does not appear to me that we have sufficient evidence at present to show that the antheridia are male organs. So far as they are concerned we have conjecture and nothing more. All that is proved is: 1. That the spores are bodies which reproduce the plant, and are, therefore, analogous to seeds; and 2. That the structure of the antheridia and pistillidia is wholly at variance with that of stamens and pistils properly so called.

Mr. Griffith, nevertheless, in an elaborate Memoir on *Antheridia* & *Sporidia*, published in the Calcutta Journal of Natural History, adopts in the fullest manner the opinion that Acrogens have sexes, as will appear hereafter. It is, however, to be observed that the question is not, whether there may not be in such plants as there are three or four male and female principle, or certain organs in which it is probable that such a principle resides; but whether there is any such structure as that which we have to be content to call all the classes of plants higher than Acrogens. And I must confess, after reading Mr. Griffith's very learned and ingenious observations, that my opinion remains unchanged as to the existence of most essential differences between Acrogens and other plants in all that regards the organs of reproduction.



A remarkable point of structure in Liverworts is the spiral filament, or elater, as it is called, lying among the sporules within the spore-case. This consists of a single fibre, or of two, twisted spirally in different directions, so as to cross each other, and contained within a very delicate, transparent, perishable tube. They have a strong elastic force, and have been supposed to be destined to aid in the dispersion of the sporules,—a most inadequate end for so curious and unusual an apparatus. It is more probable that they are destined to fulfil, in the economy of these plants, some function of which we have no knowledge.

One of the most extraordinary points in the history of the Muscal Alliance, is the fact that in the cells of the antheridia are generated bodies having what seems to be spontaneous motion, and apparently of the same nature as the spermiatic animalcules of animals. This unexpected fact has been fully and correctly described by Meyen, (*Ann. Sc. Nat. N. S. x. 319*), who has found the same creatures (?) in the correspond-

ing organs of Chara and Marchantia. Unger has also published an elaborate Memoir upon this singular subject. (*Ann. Sc. N. S. xi. 257 and 274.*) He describes the spiral threads of Sphagnum thus:—"These animalcules consist of a thick and swollen body having a slender threadlike appendage. The length varies between the

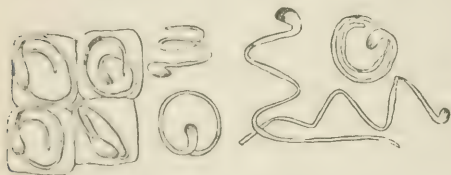


Fig. XXXV.

$\frac{1}{80}$  of a line Vienna measure. The length of the appendage is about  $4\frac{1}{4}$  longer than the body, so that the total length of the animal may be stated to be the 0.01 of a line." It is to be observed by those who may search for such bodies that they can only be found just when the antheridium is completely formed, and that a magnifying power of at least 600 diameters is required for their detection. Unger regards them as analogous to the genus of animalcules called Spirillum. It is so improbable that animals should be generated in the cells of plants, unless accidentally, that we cannot but entertain grave doubts whether, notwithstanding their locomotive powers, these bodies are really any thing more than a form of vegetable matter; and it is worth considering if they may not after all be a diminutive representation of the clavate processes surrounding the spore of Equisetum, and perhaps of the elaters found in the spore-cases of Liverworts. This is certain, that the spores and elaters of Equisetum, when at rest, have very much the appearance of the Spirilla in the antheridium of an Urn Moss or a Chara; and since it has been proved that the spiral filaments of Equisetum arise from the splitting of a cell in which a spore is generated, there seems no reason why a similar action should not take place in cells that are destitute of spores. As to the motion, how are we to tell that it is not a hygrometrical action? There is as active a motion in the elaters of Equisetum as in the spirilla of Mosses, only it arises in the former from drying and in the latter from floating in water. Nägeli has lately found the spiral threads of Liverworts in the leaves of Ferns.

Equisetum may be regarded as a link between this alliance and Chara on the one hand, while its high degree of composition brings it into the neighbourhood of Ferns and Clubmosses.

By some Botanists the orders of the Muscal Alliance are separated into two great groups, Hepaticæ and Musci; of which the former are without an operculum and have for the most part elaters, while the latter have an operculum and always want elaters. But such distinctions seem to be of hardly sufficient importance to be employed for higher purposes than the distinction of Natural orders.

#### NATURAL ORDERS OF MUSCALS.

##### 1. HEPATICÆ.

- |   |                      |
|---|----------------------|
| <i>Spore-cases valveless, without operculum or elaters . . .</i>  | 15. RICCIACEÆ.       |
| <i>Spore-cases valveless or bursting irregularly, without operculum, but with elaters . . .</i>               | 16. MARCHANTIACEÆ.   |
| <i>Spore-cases opening by a definite number of equal valves, without operculum, but with elaters . . .</i>    | 17. JUNGERMANNIACEÆ. |
| <i>Spore-cases peltate, splitting on one side, without operculum, and with an elater to every spore . . .</i> | 18. EQUISETACEÆ.     |

##### 2. MUSCI.

- |  |                |
|--|----------------|
| <i>Spore-cases opening by valves, with an operculum, without elaters . . .</i> | 19. ANDRÆACEÆ. |
| <i>Spore-cases valveless, with an operculum, without elaters . . .</i>         | 20. BRYACEÆ.   |



## ORDER XV. RICCIACEÆ. CRISTALWORTS.

*Riccia*, *Nees Lichen. St., Besch. d. N. u. S. 1st. ed.*, 2. 1844, *Botan. Beech.*, vol. III. (Humboldt, *Essai. Gen. XII.*)

DIAGNOSIS.—*Spores and foliules, without appendages or claters.*

Terrestrial herbs, of diminutive size, inhabiting mud or water, swimming or floating, usually annual, their leaves and stems blended into a frond of a cellular structure,



FIG. XXXVI.

erect, green or purple, with a distinct epidermis, and a cavity of air-passages beneath it in some species. Anthidia immersed in the frond, with their mouth projecting in the form of a papilla, or a slender cone. Pistillia in the frond at the centre or a different individual, immersed or superficial, sessile or stalked; the common mycelium either naked or scaly; the involucre sessile or in the form of little fladders perforated at the point. Spores cases membranous, united to a calyptra, or distinct from it, bursting irregularly when ripe. Spores triangular, pyramidal, and half round, without claters.—*Endl.*

These little plants form a plain transition from Thallogens to Aerogens. They have that combination of leaves and stem into what is called a frond, which is characteristic

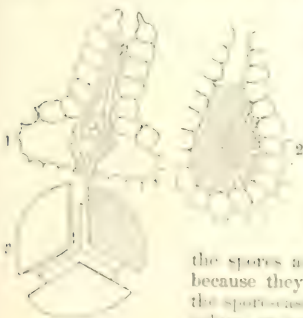


FIG. XXXVII.

of Lichens, and their spores may be not unaptly compared to the tetraspores of the Rosmarinifer order. But, on the other hand, their spores are collected in large numbers within organs resembling the pistils of phanerogamous plants; they have a distinct axis of growth, and an epidermis is distinctly formed with stomates for breathing with. (*See Laminaria*, l. c.) While, however, for the latter reasons, they are to be regarded as more elevated in the scale of organization than Lichens, or scum plants, they are inferior to Liverworts and Sphenocarpus, because of the absence of those aerial springs called claters, by which, in the latter orders, the spores are dispersed; and to Sphenocarpus and Laminaria, because they want the complicated apparatus which is added to the sporocarpia of those orders, under the form of lobes, an operculum, or peristome. According to Endlicher, the Crustulaceæ pass through Corallia into the rank of Liverworts, and by Sphenocarpus into that of Scum-mosses. There is a third genus, *Cladonia*.

Unger, of the anatomy of *Riccia glauca*, in the *Linnaea*, vol. xiii. p. 3. This genus *Riccia* is regarded by Messrs. Bory and Montagne as forming the natural transition to Liverworts; they describe it as fructifying under water, which is very seldom the case with the other Crustulaceæ. *Ann. S. N.* 3. ser. i. 129.

Of the species hitherto known, two thirds have been discovered in Europe, and the remainder in various parts of the world. Several species in North America, the Cape of Good Hope, and Brazil, appear to be very similar to those of Europe.—*Endl.*

The uses of Crustulaceæ are unknown.

## GENERA.

<i>Durinea</i> , B. & Mont.	<i>Hemiscyrtia</i> , Ricc.	<i>Sphenocarpus</i> , M. & Mont.	<i>Cladonia</i> , Thunb.
<i>Riccia</i> , Michx.	<i>Ricciocarpus</i> , Cord.	<i>Oxycarpus</i> , Endl.	<i>Leptocarpus</i> , Thunb.
<i>Lichocarpus</i> , Ricc.	<i>Salvinella</i> , Thunb.	<i>Leptocarpus</i> , Cord.	<i>Leptocarpus</i> , Thunb.
<i>Ricciella</i> , A. Braun.	<i>Hemiscyrtia</i> , Ricc.	<i>Leptocarpus</i> , Cord.	<i>Leptocarpus</i> , Thunb.

## NUMBERS. GEN. &amp; SP. VI.

*Leptocarpus*, Thunb.

POSITION. Bryaceæ.—RICCIALES.—Mosses.

*Leptocarpus*, Thunb.

Fig. XXXVI.—1. *Riccia natans*, a leaf magnified; 2. a young frond of *Riccia natans*; 3. spores.

Fig. XXXVII.—*Riccia glauca*. 1. A young specimen; 2. leaf with stomata; 3. spores in the mother cell. *Leptocarpus*.



## ORDER XVI. MARCHANTIACEÆ.—LIVERWORTS.

*Hepaticæ*, Juss. *Gen.* 7. (1789); *DC. Fl. Fr.* 2. 415. (1815); *Agardh Aph.* 104. (1822); *Nees ab Escab. in Martius, Fl. Bras.* 1. 295. (1833); *Hooker's British Flora*, vol. ii. p. 97. (1833); *Bischoff de Hepaticis in Act. Acad. Nat. Cur.* xvii. pars 2. (1836); *Ann. des Sc. 2. ser.* 4. 309. (1836).—*Marchantiaceæ and Targioniaceæ*, *Ed. pr. Endl. Gen.* xx.—*Marchantieæ and Targioniæ*, *Nees Lebermoos*, 84.—*Marchantieæ*, *Taylor in Linn. Trans.* 17. 377.

DIAGNOSIS.—*Spore-cases valveless, or bursting irregularly, without operculum, but with elaters.*

Plants growing on the earth or trees in damp places, composed entirely of cellular tissue, emitting roots from their under-side, and consisting of an axis or stem which is leafless, but bordered by membranous expansions, which sometimes unite at their margins, so as to form a broad lobed frond, having a distinct epidermis pierced by stomates. Antheridia either immersed in the frond, or placed on disk-like sessile or stalked peltate receptacles. Pistillidia lurking within involucre, either placed below the edge of the frond, or on the edge or under-side of stalked heads. Spore-cases stalked, opening by irregular fissures, or by separate teeth. Spores globose, with elaters.

With these plants organization advances another step. To the spores of the Crystalworts are added spiral threads or elaters for their dispersion; and various lacerated membranes surrounding the spore-cases seem to be imitating the calyx and corolla of perfect plants. There is still, however, a want of true leaves, which are fused, with the stem, into a frond. The principal part of the order has the spore-cases raised on a long stalk, and clustered into a head; but this character is missing in Targioneæ, which Endlicher regards as a distinct order. In these plants, as in Mosses and Charas, each cell of what are called the antheridia contains a body resembling an animalcule of the genus *Vibrio*, which moves about rapidly in water, as soon as it is liberated from its birth-place. Germination takes place by an universal increase and enlargement of the spore, which becomes lobed, as it were, by the swelling of the cellulæ, and is afterwards nourished by the emission of a radicular

fibre. The original development of Ferns and Liverworts is much the same. *Fl. Bras.* i. 299.

The Liverworts differ from Crystalworts in having elaters and involucre spore-cases, and from Scalermosses or Jungermanniaceæ, in the want of power to separate their spore-cases into distinct valves.

Natives of damp shady places in all climates; two were found in Melville Island. The only atmospheric condition to which they cannot submit is excessive dryness.

Little is known of their uses. De Candolle thinks it probable that the larger kinds will be found to resemble foliaceous Lichens in their qualities. A few are slightly fragrant, with a subacid taste. They have been employed in liver complaints, but their use seems a mere superstition. It is, however, alleged that *Marchantia hemisphærica* has really proved advantageous in dropsical affections.

## GENERA.

Suborder I. MARCHANTIEÆ.—Spore-cases capitate. Involucres membranous, regularly slit.	<i>Dietyochiton</i> , Cord. <i>Fegatella</i> , Radd. <i>Concephalus</i> , Vaill. <i>Cymophyllum</i> , Wigg. <i>Lunularia</i> , Michel. <i>Sedgwickia</i> , Bowd. <i>Plagiochasma</i> , Lelam. <i>Ottonia</i> , Cord. <i>Sedgwickia</i> , Bisch. <i>Ailania</i> , Forst. <i>Ruppinia</i> , L. f. <i>Antrocephalus</i> , Lelam. <i>Rebouillia</i> , Radd.	<i>Asterella</i> , Palis. <i>Rhakiocarpon</i> , Cord. <i>Achiton</i> , Cord. ? <i>Mesorigma</i> , Cord. <i>Sauteria</i> , Nees. <i>Hampia</i> , Nees. <i>Dumortiera</i> , Nees. <i>Hypophylla</i> , Mack. <i>Hypophylla</i> , Tayl. ? <i>Spathysia</i> , Nees. <i>Marchantia</i> , March. <i>Astromarchantia</i> , Nees <i>Chlamidium</i> , Cord.	<i>Preissia</i> , Nees. <i>Chomiocarpon</i> , Cord.
<i>Grimaldia</i> , Radd. <i>Phenochiton</i> , Radd. <i>Syncloniseæ</i> , Radd. <i>Alania</i> , Cord. <i>Duvallia</i> , Nees. <i>Petalophyllum</i> , Nees. <i>Fimbriaea</i> , Nees. <i>Hypnandron</i> , Cord.			Suborder II. TARGIONEÆ.—Spore-cases submarginal, solitary. Involucres wanting.  <i>Targionia</i> , Michel. <i>Cyathodium</i> , Lelam. ? <i>Carpobolus</i> , Schwein. <i>Athalamia</i> , Falconer.

NUMBERS. GEN. 15. Sp. 20 ?

*Equisetaceæ.*

POSITION. Ricciaceæ.—MARCHANTIACEÆ.—Jungermanniaceæ.

*Lichenaceæ.*

Fig. XXXVIII.—1. *Marchantia commutata*, natural size; 2. a head of spore-cases; 3. a section of the disk which bears the spore-cases; 4. elater; 5. granular spore



ORDER XVII. JUNGERMANNIACEAE. — *Selaginella*[illegible]

**DIAGNOSIS.** *Sporotrichum* growing by a distinct number of equal nodules, without greenness, but with white.

Creeping moss-like plants, either with imbricated very cellular leaves surrounding a central axis, or with the leaves and axis all fused into one continuous body, or



F. 5515.

Antheridia scattered, free, or immersed. Pistillidia solitary, with both involucre and involucl. Spore-

cases without an oper-  
culum, 4-ported, or 4-  
valved, with or with-  
out a central columella. Spores mixed with

Here the approach to a higher organization becomes more manifest. Instead of a frond consisting of a stem and the leaves not distinguishable from it, we have, in the majority of cases, well-defined separate symmetrical leaves; and in the section Anthocerotae there is a central columella, which is evidently a transition to the structure of the Urmosses. These *Selagin* differ from the Liverworts in the regularly valved condition of the spore-cases, and in their long-stalked simple form. In *Blasia* and others, the habit is that of the Liverworts.

Shady woods in hot climates appear to be most prolific in these plants, which, however, seem capable of growing wherever the climate will produce Lichens. The thapsus are very rich in them.

Their uses are unknown.

## GENERAL

Suborder I. J. SHERMAN. Setae. Spores 1 or 4 valued without a co- lunella.	<i>Romaria</i> , Radd. <i>Metazoria</i> , Cord. <i>Sarcosporium</i> , Cord.	<i>Diplazium</i> , Dumort. <i>Diplazium</i> , Dumort. <i>Ceratomyces</i> , Nees <i>Diplazium</i> , Cord.	<i>Quercus</i> , Sw. <i>Quercus</i> , Sw. <i>Pinus</i> , L. <i>Pinus</i> , L.
<i>Metazoria</i> , <i>Metazoria</i> , Radd. <i>Echinomitrion</i> , Cord. <i>Echinomitrion</i> , Dumort. <i>Fusoidia</i> , Dumort.	Haplolaenidae. <i>Blasia</i> , Michx. <i>Synchyryna</i> , Nees et <i>Moss</i> <i>Pellia</i> , Radd. <i>Selaginella</i> , Dumort.	<i>Ceratophyllum</i> , <i>Pteris</i> , L. <i>Ceratophyllum</i> , <i>Jubula</i> , <i>Polypodium</i> , L. <i>Polypodium</i> , L. <i>Polypodium</i> , L.	<i>Pinus</i> , L. <i>Pinus</i> , L. <i>Pinus</i> , L. <i>Pinus</i> , L. <i>Pinus</i> , L. <i>Pinus</i> , L. <i>Pinus</i> , L.
<i>Aneuridae</i> . <i>Trichostylium</i> , Cord. <i>Aneuria</i> , Dumort.	<i>Diplazium</i> , <i>Hellia</i> , Fries. <i>Rhizaria</i> , Fries.	<i>Polypodium</i> , L. <i>Polypodium</i> , L. <i>Polypodium</i> , L.	<i>Pinus</i> , L. <i>Pinus</i> , L. <i>Pinus</i> , L.

FIG. XXXIX.—1. Spore case of *durum* after hyaline red and brown; 2. The same very young and covered with its calyptra; 3. Plaster and spore; 4. Another spore.

Fig. XL.—*Jun. ermannia bidentata*.

Fig. XI.1.—1. *Monoclea crispata*, a little magnified; 2. *Spiraea* at 100 times; 3. *Sparganium* and *Sparganium*.



<i>Psilidæ</i> <i>Psilidium</i> , <i>Nees</i> . <i>Blapharozia</i> , <i>Dumort.</i> <i>Trichocolea</i> , <i>Nees</i> . <i>Thrichoclea</i> , <i>Dumort.</i> <i>Thricoclea</i> , <i>Dumort.</i>	<i>Mastigobryum</i> , <i>Nees</i> . <i>Pleuroschismatypus</i> , <i>Dum.</i> <i>Calypogeia</i> , <i>Radd. part.</i> <i>Cincinnadus</i> , <i>Dumort.</i>  <i>Geocalycidæ</i> <i>Gongylanthus</i> , <i>Nees</i> . <i>Geocalyx</i> , <i>Nees</i> . <i>Saccogyna</i> , <i>Dumort.</i> <i>Syckorea</i> , <i>Cord.</i>  <i>Jungermannidæ</i> . <i>Gymnoscyphus</i> , <i>Cord.</i> <i>Cheiloscyphus</i> , <i>Cord.</i> <i>Marsupella</i> , <i>Dum. part.</i> <i>Harpanthus</i> , <i>Nees</i> . <i>Gymnanthe</i> , <i>Taylor</i> .	<i>Lophocolea</i> , <i>Nees</i> . <i>Jungermannia</i> , <i>Dill.</i> <i>Aplozia</i> , <i>Dumort.</i> <i>Lophozia</i> , <i>Dumort.</i> <i>Cephalozia</i> , <i>Dumort.</i> <i>Anthelia</i> , <i>Dumort.</i> <i>Blapharostoma</i> , <i>Dum.</i> <i>Odontoschisma</i> , <i>Dum.</i> <i>Plagiochila</i> , <i>Nees et Mont.</i> <i>Radula sect.</i> , <i>Dumort.</i> <i>Scapania</i> , <i>Dumort.</i> <i>Candollea</i> , <i>Radd.</i> <i>? Notarisia</i> , <i>Coll.</i>  <i>Gymnomitridæ</i> . <i>Alicularia</i> , <i>Cord.</i> <i>Mesophylla</i> , <i>Dumort.</i> <i>Acrobolbos</i> , <i>Nees</i> .	<i>Sarcoscyphus</i> , <i>Cord.</i> <i>Marsupia</i> , <i>Dumort.</i> <i>Marsupella</i> , <i>Dumort.</i> <i>Gymnomitrium</i> , <i>Nees</i> . <i>Acolea</i> , <i>Dumort.</i> <i>Haplomitrium</i> , <i>Nees</i> . <i>Mniopsis</i> , <i>Dumort.</i>  <b>Suborder II. ANTHOCERO-</b> <b>OTÆ.</b> — <i>Nees</i> . Spore- cases pod-shaped, split on one side, or 2-valved, with a columella.  <i>Anthoceros</i> , <i>Mich.</i> <i>Anthocerites</i> , <i>Corda</i> . <i>Monoclea</i> , <i>Hook.</i> <i>Cladobryum</i> , <i>Nees</i> .
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NUMBERS. GEN. 42. Sp. 650 ?

POSITION. Marchantiaceæ.—JUNGERMANNIACEÆ.—ANDREACEÆ.

The genera present a wonderful variety in the reproductive organs, but in almost all the existence of pistillids and antherids has been demonstrated, and in most cases the development of the spore-cases from the so-called pistillids has been traced. In those in which the plants most resemble Mosses (Bryaceæ) in vegetation, as in *Jungermannia*, the pistillids are very like those of Mosses; this is also the case in *Marchantia*; but in *Pellia*, *Anthoceros*, and other genera, the rudiment of the spore-case bears a striking resemblance to the so-called ovules of Ferns, *Rhizocarps*, &c., occurring upon the expanded fronds the same way as those bodies do upon the pro-embryos of the said families. In all cases the physiological stages are analogous to those of Mosses; since the pistillids produced upon the fronds or leaf-bearing stems developed directly from the spores, go on to produce a spore-case alone, in which the new spores are developed, without the intervention of the stage of existence presented by the pro-embryo of Ferns and Horsetails (Equisetaceæ), where the pistillids and antherids occur upon a temporary frond, and the former give origin to the regular stem and leaves of the plant.—*Henfrey*.

#### ADDITIONAL GENERA.

*Steezia*, *Lehm.* = *Blyttia*, *Emll.*  
*Pleuranthe*, *Taylor*, near *Jungermannia*.

*Zoopsis*, *Hooker fil.*



## ORDER XVIII. EQUISETACEÆ.—HORSETAILS.

*Epheura*, DC. Fl. Fr. 2: 380 (1825). *Equus*, Lf. 116 (1759). *Woodsia*, Presl, 800 (1824). *Urtica*, Lf. 207 (1759). *Urtica*, Lf. 116 (1759). *Urtica*, Lf. 116 (1759).

DIAGNOSIS.—*Sporangia polate*, splitting inwards, without operculum, and with an elater to every spore.

Leafless branched plants with a striated fistular stem, in the entire of which sap is secreted; the articulations separable and surrounded by a membranous (periderm) sheath. Stem fistular, with many longitudinal cavities in its secondary lumen; chiefly consisting of cellular substance, but coated externally with a layer of hard woody tubes, from which plates of a similar nature project towards the centre, partially dividing the longitudinal cavities from each other. Sometimes arranged longitudinally on the cuticle. Spiral vessels very small but abundant. Spore-cases opening inwards by a longitudinal slit, attached to the lower face of pedate scales, which are collected into terminal cones. Spores, oval grains, wrapped round with a pair of highly elastic clavate elaters.

The remarkable plants known by the vulgar name of Horsetails, seem to have no very decided affinity to any existing order. With Ferns their relation is not obvious. In the arrangement of their reproductive organs they have a striking resemblance to *Zamia*, and in their general aspect to *Ephedra* or *Casuarina*. Their germination is that of Cellular plants, and approaches nearly to *Urnosses*. The structure of their stem is well described by Ad. Brongniart in his *Histoire de l'Équiste*, as are, indeed, other parts of their organisation: see Tables 11 and 12 of that work. This ingenious writer entertains the opinion that the green body, which is known to be the spore, is a naked ovule, and the four swollen filaments that surround it four grains of pollen united in pairs to the base of the ovule. In the last edition of this work I adopted M. Brongniart's view, and accordingly placed *Equisetum* with *Coniferae*, an error so very obvious, as to have called forth rebukes, which were richly deserved. The development of the swollen filaments has been carefully observed by Mohl, Henderson, and others, who have demonstrated that they are really produced by the spiral splitting of the cell in which the spore is formed; in fact, they appear quite analogous, as Mr. Griffith has stated, to the elaters of *Marchantia* and its allies, to which the order bears, perhaps, a nearer relation than to any other plant. To regard Horsetails as a high form of the Muscal alliance seems to me more expedient than to station them with Ferns and Clubmosses, to which they seem to have no immediate affinity. The resemblance between the pedate scales of *Equisetum* and the heads of spore-cases in *Marchantia*, is too obvious not to strike the most unpractised observer. Link calls these scales *Sporidochia*.

The germination of the spores has been explained, both by Agardh and Bischoff. The former (*Arch. 120*) describes it thus: from three to fourteen days after they are sown, they send down a diffuse, byzantine, somewhat clavate, simple root, and protrude a confervoid, cylindrical, striated, apiculate, torulose thread, either two-lobed (in *E. pratense*) at the apex, or simple (in *E. palustre*). Some days after, several branches grow out and are apiculated likewise, forming a body resembling a bundle of confervoid threads, each of which produces its own root. The account of Bischoff (*Nov. Act. Acad. N. Göt. 1844*) is not so generally admitted; he finds the confervoid threads, or numerous processes of cellular development, as in



FIG. XLII.



FIG. XLIII.



growing and combining, until a considerable cellular mass is formed; then this mode of development ceases, and a young bud is created, which springs up in the form of the stem of the Equisetum, at once completely organised, with its air-cells, its central cavity, and its sheaths, the first of which is formed before the elongation of the stem, out of the original cellular matter.

Horsetails are found in ditches and rivers in most parts of the world, within and without the tropics.

None are of importance in a medical point of view; they are said to be slightly astringent and stimulating, and have even been recommended as diuretics and emmenagogues; they are, however, not now employed. In economical purposes they are found to be useful for polishing furniture and household utensils—a property which is due to the presence of a great quantity of silex in their cuticle. According to the observations of John of Berlin, they contain full thirteen per cent. of siliceous earth. The ashes have been found by chemists to contain half their weight of silica. The quantity of silex contained in the cuticle of Equisetum hyemale is so great, that Sivright succeeded in removing the vegetable matter and retaining the form. On subjecting a portion of the cuticle of Equisetum hyemale to the analysis of polarised light under a high magnifying power, Brewster detected a beautiful arrangement of the siliceous particles, which are distributed in two lines parallel to the axis of the stem, and extending over the whole surface. The greater number of the particles form simple straight lines, but the rest are grouped into oval forms, collected together like the jewels of a necklace, by a chain of particles forming a sort of curvilinear quadrangle, these rows of oval combinations being arranged in pairs. Many of those particles which form the straight lines do not exceed the 500th of an inch in diameter. Brewster also observed the remarkable fact, that each particle has a regular axis of double refraction. In the straw and chaff of Wheat, Barley, Oats, and Rye, he noticed analogous phenomena; but the particles were arranged in a different manner, and displayed figures of singular beauty. From these data it is concluded that the crystalline portions of silex and other earths, which are found in vegetable tissues, are not foreign substances of accidental occurrence, but are integral parts of the plant itself, and probably perform some important function in the process of vegetable life. A very large quantity of starch is found during winter in the rhizomes; in whose cells, during the month of October, the particles may be seen in active motion, passing up one side, and retreating by the other, much in the same way as in Chara. This I have often noticed in Equisetum fluviatile.

#### GENUS.

Equisetum, L.

NUMBERS. GEN. 1. Sp. 10

Characeæ.

POSITION. Marchantiaceæ.—EQUISETACEÆ.

Gnetaceæ.

The first discovery of the analogy between the development of the spore in germination in the Ferns and Equisetaceæ, is due to M. G. Thuret, who saw the spores of the latter produce a cellular pro-embryo somewhat like that of the Ferns, and in this were developed antheridis of analogous structure, emitting cellules containing many spiral filaments. This announcement was confirmed by M. Milde, whose observations extended over some months, during which time no “ovule” was produced, but he saw what appeared to be the rudiment of one. Dr. Mettenius states that he has met with decaying “ovules” precisely like those of the Ferns, upon the pro-embryo of one Equisetum; and thus the evidence is completed, so far as the occurrence of the two kinds of organs is concerned.—*Henfrey.*



Fig. XLIV.

M. Thuret, in his last work (*Recherches, &c.*), describes the antheridis as growing at the end of the lobes of the prothallium. They are larger than in Ferns. The terminal cells of the lobes separate to allow the antherozoids to escape, and remain on the lobes like minute coronets. The antherozoids themselves resemble those of Ferns.

Fig. XLIV.—Antherid of Equisetum, magnified; with three antherozoids, still more magnified, seen at the side—after Thuret.



## ORDER XIX. ANDRACEAE.—S. LINDBERG.

*Andromeda*, *Norsk Fl.* 24 (1830), *Medd.* 66: 410.DIAGNOSIS.—*Sporophores opening by valves, with very persistent, cartilag. lid-like.*

Branching moss-like reddish or brown plants, with subterminal ribbed or reticulate.

Sporophores with a calyptra, seated on a fleshy apophysis, splitting laterally into four equal valves; when mature the valves are always bound together by the persistent operculum. (See stone 6). Spores surrounding a central columella.

Lindberg considered the only genus of which this order consists, the name as *Jungermannia*; more recent observers have with reason, if to associate with *Urmosses*. It usually, however, belongs more to the one than the other; if it agrees with *Urmosses* in having an operculum it disagrees in having a very persistent sporophore; and if it agrees with the *Scandemosses* in the latter circumstance, it differs from them in perianth, and in the want of lid-like.

Natives of cold and temperate regions, especially on rocks in these places, as high as the limits of eternal snow, where they form a dense mat.

Their uses are unknown.

## GENERA.

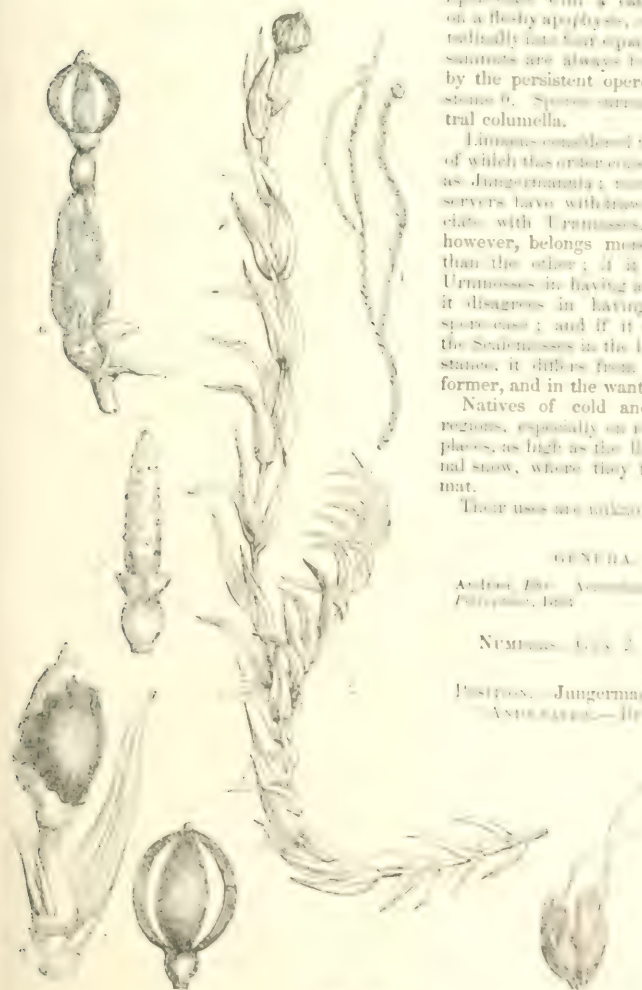
*Andromeda*, *Fl.*—*Scandemoss*, *Winkl.* 11; *Polytrichum*, *Fl.* 11.NUMBERS.—*Fl.* 2, *St.* 11.POSITION.—*Jungermannia*.ANDRACEAE.—*Bryum*.

FIG. XLIV.

FIG. XLIV.—1. *Andromeda* nivalis, natural size; 2. the same, fruiting; 3. *Scandemoss* with the lid-like operculum; 4. spore case after the dissection of the lid-like operculum; 5. a spore case with a lid-like operculum; 6. *Andromeda* rupestris much magnified; 7. its lid-like operculum; 8. *Scandemoss* with the lid-like operculum; 9. *Scandemoss* with the lid-like operculum; 10. *Scandemoss* with the lid-like operculum.



## ORDER XX. BRYACEÆ.—URNMOSSES.

Musci, *Juss. Gen.* 10. (1789); *Hedwig Deser. et Adumb.* (1787-1797); *Bridel Muscolog. recentiorum* (1797-1803); *Hedw. Species Muscor. Frondos.* (1801); *Palisot Prodrome des 5 et 6 Fam. de l'Éthéogam.* (1805); *Bridel Suppl.* (1806-1819); *Weber Tabul. Musc. Frondos.* (1813); *DC. Fl. Fr.* 2. 438. (1815); *T. F. L. Nees de Muscor. Propag.* (1818); *Hooker and Taylor, Musc. Brit.* (1818); *Hooker, Musci Exotici* (1818-1820); *Agardh Aphor.* 105. (1822); *Greville and Arnott in Wern. Trans.* 4. 109. &c. (1822); *Nees v. Esenbeck, Hornschuch, and Sturm, Bryolog. Germ.* (1823); *Grev. Fl. Edin.* xiii. (1824); *Ad. Brongn. in Dict. Class.* 11. 248. (1827); *Hooker. Brit. Fl.* 1. 459. (1830). - Bryaceæ, *Ed. pr.* (1836); *Endl. Gen.* xxiv. Sphagnaceæ, *Endl. Gen.* xxiii.

DIAGNOSIS.—*Spore-cases valveless, with an operculum, without claters.*

Erect or creeping, terrestrial or aquatic, cellular plants, having a distinct axis of growth, destitute of a vascular system, and covered with minute imbricated, entire, or serrated leaves. Reproductive organs of two kinds, viz. 1. Antheridia, which are axillary,

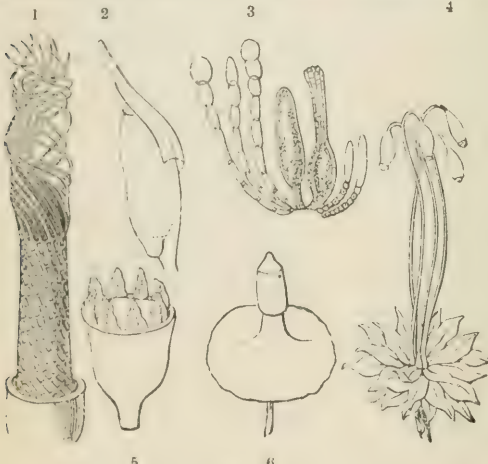


Fig. XLV.

cylindrical or fusiform stalked sacs, containing a multitude of spherical or oval particles emitted upon the application of water, and coiled up bodies which move in water with activity; 2 Pistillidia, or flask-like bodies inclosed within a convolute bract, which is eventually carried up upon the point of the spore-case. Spore-cases, or ripened pistillidia, hollow urnlike vessels, seated upon a seta or stalk, covered by a membranous calyptra, closed by a lid or operculum, beneath which are one or more rows of cellular rigid processes, called collectively the peristome, and separately teeth, which are always some multiple of four,

and combined in various degrees; the centre of the theca is occupied by an axis or columella, and the space between it and the sides of the theca is filled with sporules. Sporules in germination protruding confervoid filaments, which afterwards ramify, and form an axis of growth at the point of the ramifications.

These little plants, which form one of the most interesting departments of Cryptogamic Botany, are distinctly separated from all the previous tribes by the peculiar structure of their reproductive organs, in which they resemble no others, except the Sealemosses, whose approach, however, is more apparent than real. In their organs of vegetation they are strikingly similar to many Clubmosses, to which, perhaps, an approach is made by Sphagnum, whose spore-case has no peristome, on which account, indeed, that genus is regarded as a distinct Natural Order by Endlicher.

For a long time Urmosses were considered to be destitute of stomates; but first Treviranus, and afterwards Valentine, distinctly proved those organs to be present; (*Linn. Trans.* 18, 239). In addition to such apertures, some of the cells of certain species of Sphagnum are pierced with large round openings; and Røper has observed, that such perforated cells are the habitation of the animalcule called *Rotifer vulgaris*. (*Flora*, 1838, p. 17.) Mohl has observed similar openings in the cells of *Leucobryum vulgare*, (*Dicranum glaucum*.) and *Octoblepharum albidum*; he thinks they are formed subsequently to the construction of the cells. *Ann. Sc. N. s.* xiii. 108. Schleiden confirms

Fig. XLV. - 1. Peristome of *Tortula ruralis*; 2. Theca of *Ceratodon purpureus*; 3. Supposed representatives of sexual organs in *Mesia longisetia*; 4. *Bryum roseum*; 5. Peristome of *Octoblepharum albidum*; 6. Apophysis and theca of *Splachnum luteum*.



this, and adds to the list of porous *Uromyces*, *Goodii*, *farum cylindricum*, *Elwyni*, *don-spegazzii*, and *Lundbergia minus*, *Androm.* and *longistoma*.

Mr. Griffith (*Atl. Journ.* v.) strenuously advocates the sexuality of the *Androm.* and *Pistillaria*, regarding the former as a true male apparatus, and the latter as a pistil containing an ovule. I do not know that he has anywhere adduced proof of the validity of this opinion; and it is difficult to comprehend upon what evidence such a theory depends; it may, however, be presumed, that he considers the minute branched embryos, formed in vast numbers. This considerable observation, that evidence in favour of fecundation in some way in *Mosses* and *ferns*, is attached to the breaking up of the tissue, terminating and closing what he calls the style, that is to say, the point of the pistillidium, subsequently to the application of a particular agent, whereby the style becomes a canal, opening externally by a fissure, downwards to the orifice of this canal, extending downwards until it reaches the cavity of the distal ovary, and by a corresponding enlargement of a cell (the ovule) existing in that cavity. Mr. Valentine, however, does not regard these appearances as connected with fecundation.

An uninitiated person, reading the definition of a genus of *Uromyces*, might suppose that to be the tribe in which an approach to the animal creation must surely takes place. Unacquainted with the exact meaning of the Latin words employed by Bryologists, he might understand by the peristomium a jaw, by the calyptra a nightgown, and by the struma a kind of goutre; and when he saw that teeth belonged to this jaw, he would naturally conclude that it was really a vegeto-animal of which he was reading. Struck with the evident absurdity of giving such names to parts of plants, without at the same time explaining their real nature, I formerly ventured to call the attention of naturalists to the subject by the following paragraph in the *Outline of the Pine-Tree-epidemics of Botany*.

"The calyptra may be understood to be a convolute leaf; the operculum another; the peristomium one or more whorls of minute flat leaves; and the theca itself to be the excavated distended apex of the stipe, the cellular substance of which separates in the form of spores."

The reasoning upon which I conceived this hypothesis to be sustained, was the following:—Every one agrees in describing the calyptra as a membrane arising from between the leaves and the base of the young sporocarp, and as enveloping the latter, but having no organic connexion with it: when the stipe of the sporocarp, lengthening, its corresponding extension of the parts of the calyptra takes place; so that it must be either ruptured at its apex (as in *Jungmannia*), or at the base; and in the latter case it would necessarily be carried up upon the tip of the sporocarp, which it originally enveloped. Now, what can be more reasonable than that such an organ, situated as thus described, should be one of the last convolute leaves of the axis which the sporocarp terminates, bearing the same relation to the latter as the convolute bractee to the flower of *Magnolia*, or, to speak more precisely still, as the calyptriform bractee to the flower of *Pileanthus*? If the calyptra be anatomically examined, especially in such genera as *Tortula* and *Dicranum*, no difference in its tissue and that of the leaves will be observable; and that very common tendency to dehisce on one side only as the diameter of the theca increases, which characterises the dimidiato calyptra, may be understood to be a separation at the line where the margins of the supposed bud turned in the mitiform calyptra this separation at a given line does not take place, and the consequence is an irregular laceration of its base. The analogy of the calyptra being of this nature, the next inference would naturally be, that the part it contains corresponds with a flower-bud. Upon this supposition, the external series of parts belonging to this supposed bud would be the operculum; the adhesion of this organ to the sporocarp, which would answer to the apex of the axis, or to the tube of the ovary of flowering plants, would be analogous to what occurs in *Eucalyptus*, or perhaps more exactly to that of *Eschscholtzia*. As to the number of the parts, in a state of adhesion, of which it is made up, it will be observed that in the paragraph above quoted, it is stated to be one only. My reason for adopting this conclusion was the absence of any trace of division upon its surface or in the substance of its tissue, and also the repeated identity of nature between it and the calyptra when both are young, in the *Tortula* and *Dicranum* genera already cited. With regard to the peristomium:—The teeth, as they are called, occupy one or more whorls; they are evidently not mere serratures of a membrane, because they are in a constant and regular number in each genus, and that number is universally some multiple of 4, as the floral leaves of flowering plants are ordinarily of 3, 4, or 5; they have the power of continuing in adhesion with each other by their contiguous margins, as the floral leaves of flowering plants; they alter their position from being inflexed with their points to the axis, to being reversed with their points turned outwards, exactly as happens in flowering plants; the mouth of the lower



peristomium often alternate with those of the outer, thus conforming to the law of alternation prevalent in the floral leaves of flowering plants; and, finally, if we compare the various states of the leaves of *Buxbaumia aphylla* with the teeth of other Urmosses, it is impossible not to be struck with the great similarity in the anatomical structure of the two. These considerations led me to the conclusion, that the calyptra, operculum, and teeth of Urmosses, are all modified leaves; and hence that the spore-case is to be considered more analogous to a flower than to a seed-vessel. With regard to the membrane, or epiphragma, which occasionally closes up the orifice of the spore-case, it may be considered as formed by the absolute cohesion of the leaves of the peristome, just as the operculum of the genus *Eudesmia* is formed by the cohesion of petals; and this is confirmed, first, by *Calymperes*, in which the membrane ultimately separates into teeth, and by the fact that the horizontal membrane exists most perfectly in such genera as *Polytrichum* and *Lyellia*, in which there is no distinct peristome. As to the internal structure of this curious apparatus we may regard the spore-case as the hollow apex of the axis, the sporules as a partial dissolution of its cellular tissue, and the columella as the unconverted centre. That the end of the axis or growing point of plants frequently becomes much more thickened than the spore-case of Urmosses, requires no illustration for those who are acquainted with *Eschscholtzia*, *Rosa*, or *Calycanthus*. That tissue is frequently disintegrated for particular purposes, is proved by the production of pollen out of the cellular tissue of an anther, and by the general law of propagation that seems to prevail in all the lower alliances of plants; the same phenomenon may be therefore expected in Urmosses. That the columella should be left in this dissolution of the tissue might be expected, from its being a continuation of the seta or axis of development, the tissue of which is more compact, and of course less liable to separation, than the looser tissue that surrounds it; this is analogous to the separation of the pollen from the connective of most plants, or from parts only of the anther of all those genera which, like *Viscum*, *Ægiceras*, or *Rafflesia*, have what are called cellular anthers.

Mr. E. Quekett has lately proved the general accuracy of these views by the discovery of a monstrous moss, in which common leaves take the place of the spore-case, its peristome, and other apparatus. As this is a very curious subject, I extract at length his observations, with a few unimportant omissions:—"Soon after Mr. Ward made known his plan of growing plants in closely-glazed cases I had constructed a small case, in which were placed various Mosses, both in fruit, and having the tendency to form fruit. Among the number was a mass of *Tortula fallax*, showing, at the time, the early condition of the seta, capped with a calyptra. After watching the progress of the plants, it was discovered that the *Tortula*, which, when placed in it, showed every tendency to produce fruit, now presented, instead of fruit advancing to maturity, a miniature forest of elevated stems, leafy above and below, but in the intermediate portion, destitute of leaves; in fact, all appearance of capsules approaching maturity was dissipated. On placing some of the plants under the microscope, it was evident that the specimens were furnished with the usual leaves at the base of the plant,—the seta existed, and presented the usual brown colour, quite destitute of leaves, but in the place of the capsule, there was a continued elongation of the seta, of a green colour, bearing several green leaves, varying in number in different specimens, being generally from about twelve to twenty. It appears that the capsule had scarcely commenced to be formed, when the elements of the modified leaves, (which I conceive would have otherwise formed the capsule and peristome), having received an increased degree of heat, combined with more moisture than is natural to these plants, occasioned by the structure of the case, and by its position, instead of being converted into the ordinary capsule and peristome, the matters which entered the plants were not appropriated to the development of organs of reproduction, but underwent a change into a state fitting them apparently for the purposes of nutrition."

Mr. Quekett objects, however, to that part of the theory which assumes the spore-case to be the hollowed apex of the axis; he considers the theca and operculum to be the representatives of a consolidated calyx; the corolla to be the lining membrane, whose fringed edge constitutes a peristome, which is either single or double, and appears to be the representative of the reproductive apparatus; and the columella to be the receptacle, torus or axis on which these several organs are arranged.

Fine illustrations of the Anatomy of Urmosses will be found in Link's *Ausgew. Anat. Bot. Abbild. Fasc. 4.*

Urmosses are found in all parts of the world where the atmosphere is humid: but they are far more common in temperate climates than in the tropics. They are among the first vegetables that clothe the soil with verdure in newly-formed countries, and they are the last that disappear when the atmosphere ceases to be capable of nourishing vegetation. The first green crust upon the cinders of Ascension consisted of minute







Mr. Heufrey thus states the case as regards the fructification of these plants:—The antherids occur in the axils of the leaves or collected into a head, enclosed by numerous variously-modified leaves, at the summit of the stem. They are produced either on the same heads as the pistillids, or in distinct heads on the same individuals, such mosses being called monœcious; or the heads are found only on distinct individuals, such mosses being termed dioecious. The structure of the antherid is exceedingly simple: it consists of an elongate, cylindrical, or club-shaped sac, the walls of which are composed of a single layer of cells, united to form a delicate membrane. Within this sac are developed vast numbers of minute cellules, completely filling it, and, the sac bursting at its apex at a certain period, these vesicles are extruded. When the nearly perfect sacs are placed in water, the vesicles within appear to absorb water, and swell so as to burst the sac of the antherid, and often adhering together, they collectively appear to form masses larger than the cavity from which they have emerged. Through the transparent walls may be seen a delicate filament with a thickened extremity, coiled up in the interior of each vesicle. Often before the extrusion, but always shortly after, a movement of this filament is to be observed when the object is viewed in water under the microscope. The filament is seen to be wheeling round and round rapidly within the cellule, the motion being rendered very evident by the distinctness of the thickened extremity of the filament, which appears to be coursing round the walls of the cellule in a circle.

The pistillids of Mosses are the rudiments of the fruit or capsules. When young, they appear as flask-shaped bodies with long necks, composed of a simple cellular membrane. The long neck presents an open canal like a style, leading to the enlarged cavity below, at the base of which, according to Valentine, is found a single cell projecting free into the open space. This single cell is the germ of the future capsule; at a certain period it becomes divided into two by a horizontal partition, the upper one of these two again divides, and so on until the single cell is developed into a cellular filament—the young seta; the upper cells are subsequently developed into the urn and its appendages, and as this rises, it carries away with it, as the calyptra, the original membrane of the pistillid, which separates by a circumscissile fissure from the lower part, the future vagina. These observations of Valentine are not exactly borne out by those of Schimper in some of the details. According to this author, the lower part of the pistillid (the germen of Brown) begins to swell at a certain time, when a capsule is to be produced, becoming filled with a quantity of what he terms “green granulations.” As soon as the thickness has become about that of the future seta, the cell-development in the horizontal direction ceases, and its activity is directed chiefly to the upper part, which begins to elongate rapidly in the direction of the main axis. This elongation causes a sudden tearing off at the base, or a little above it, of the cell-membrane enveloping the young fruit, and the upper part is carried onwards as the calyptra; the lower part, when any is left, remains as a little tubular process surrounding the seta. While the young fruit is being raised up by the growth of the seta, the portion of the receptacle upon which the pistillid is borne, becomes developed into a kind of collar, and at length into a sheath (the vagina) surrounding the base of the seta which is articulated into it there.

Hofmeister describes the details much in the same way as Valentine. He states that there exists at the point where the “style” and “germen” of the pistillid join, a cell, developed before the canal of the style has become opened. In those pistillids which produce capsules this cell begins at a certain period to exhibit very active increase; it becomes rapidly divided and subdivided by alternately directed oblique partitions into a somewhat spindle-shaped body formed of a row of large cells. Meanwhile the cells at the base of the germen are also rapidly multiplied, and the lower part of the pistillid is greatly increased in size. The spindle-shaped body continues to increase in length by the subdivision of its uppermost cell by oblique transverse walls, and the opposition which is offered by the upper concave surface of the cavity of the germen, causes the lower conical extremity of the spindle-shaped body to penetrate into the mass of cellular tissue at the base of the germen, a process which resembles the penetration of the embryo into the endosperm in the embryo-sac of certain flowering plants. The base of the spindle-shaped body, which is in fact the rudiment of the fruit, at length reaches the base of the pistillid, and penetrates even some distance into the tissue of the stem upon which this is seated. The growth of the upper part going on unceasingly, the walls of the germen are torn by a circular fissure and the upper half is carried upwards, bearing the calyptra, the lower part forming the vagina. The upper cell of the spindle-shaped body then becomes developed into the capsule, and the calyptra often becoming organically connected with this, as the base of the seta does with the end of the stem; it, in such cases,



undergoes further development during the time it is being covered up by the growing fruit.

The view now entertained by Schimper, Hefenberger, and others, of the reproduction of the *Mosses*, is, that the antheridia are truly male organs, and that they serve by means of the spiral filaments, a fertilising substance upon the pistill, it being assumed that those bodies, or the fluid they are bathed in, peristome-beside, the neck of the style or neck-like portion of the pistill, to reach the central cell—the supposed embryonal cell—situated in the globular portion or ovum of the pistill, and thus render it capable of being developed into a perfect fruit.

No such process of fertilisation has actually been observed in *Mosses*; all the evidence is at present circumstantial,—but this is not strong. In the first place, it is stated as an undoubted fact by Schimper and Brown, that in the dioecious *Mosses*, those on which the antheridia and pistills occur in separate plants, fruit is never produced on the so-called male plants, and never on the so-called female, unless the males occur in the vicinity; several examples are cited in the work of Schimper, referred to. When the sexes occur alone the increase of the plant is wholly dependent on the propagation by gemmæ or innovations. Mr. Hentley, in a recent volume, expresses his opinion that, by the discovery of antherids and pistills in other *Anteropsidæ*, and the arguments from analogy greatly strengthen the hypothesis of the necessity of *Mosses*; but he admits that further observation is required, for the direct proof of the occurrence here of a process of fertilisation, an opinion in which I actually concur. To my mind, the arguments respecting the antheridia of *Mosses* appear in the present, as in other cases, to nothing more than this,—that if antheridia are so for the purpose of fertilisation, it is impossible to say far what they are intended.

Laurin Beninga has published in the *Nouv. cont. Acad. Nat. Coo.* Vol. 24, an elaborate examination of the nature of the spore-case of this order, especially with reference to the peristome. The scientific botanist who makes *Linnæus* a special study, will find an examination of that memoir indispensable.

#### ADDITIONAL GENERA.

Spruce, *Hed. f.* near *Holomitrium*.  
*Leptodontia*, *Hed. f.* near *Ceratophyllum*.  
*Cymula*, *Hed. f.*  
*Rossmannia*, *Kuhn*, near *Hypnum*.  
*Cryptocarpus*, *Urb.*  
*Tridactylum*, *Mont.* near *L. f.*  
*Leptodontium*, *Hed.* near *Lept.*  
*Acrostichum*, *Hed.* near *Tridactylum*.  
*Leptodontium*, *Hed.* near *Tridactylum*.

*Cymbaria*, *Hed.* near *Tridactylum*.  
*Reichenbachia*, *Hed.* near *Tridactylum*.  
*Phyllophora*, *Hed.*  
*Heterophyllum*, *Hed.* near *Heterophyllum*.  
*Campylodontium*, *Hed.* near *Tridactylum*.  
*Garrucha*, *Hed.* near *Tridactylum*.  
*Heterodontium*, *Hed.* near *Tridactylum*.  
*Alphitophyllum*, *Hed.* near *Tridactylum*.  
*Acrostichum*, *Hed.* near *Tridactylum*.



ALLIANCE V.—*LYCOPODALES*.—THE LYCOPODAL ALLIANCE.

DIAGNOSIS.—*Vascular Acrogens, with axillary or radical one—or many-celled spore-cases, and spores of two sorts.*

The formation of leaves, which in the Muscal Alliance had become complete, is in this group carried still further; for the leaves are now capable of generating spore-cases in their axils. That tendency to form spiral vessels which in Muscales is confined to the cellular tissue, with the single exception of the Horsetails, is now a characteristic of this Alliance, the axis containing in all cases spiral tubes in abundance. The larger of the Clubmosses seem to imitate Coniferous Gymnogens in their manner of growth, and in their tendency to collect their spore-cases in cones. The Pepperworts evidently exhibit an approach to that system of converting leaves into seed-vessels which is so generally characteristic of flowering plants. Here too it would seem that we have a great approach to the manner in which sexual organs are formed in the more perfect classes.

NATURAL ORDERS OF LYCOPODALS.

- |   |                   |
|---|-------------------|
| <i>Spore-cases 1-3-celled, axillary; reproductive bodies similar . . .</i>                      | 21. LYCOPODIACEÆ. |
| <i>Spore-cases many-celled, radical (or axillary); reproductive bodies dissimilar . . . . .</i> | 22. MARSIACEÆ.    |



## ORDER XXI.—LYCOPODACEÆ.—CAMPIDROMUS.

*Lycopodium*, *Stauro Spicata* Pillerus (1806); *R. Pinnis* Philib. 364 (1810); *Stauro*, *Art.* 36 (1822); *Gymn. Eur. Pinn.* 33. (1824); *Maritima* *Id. id.* 362 (1834); *Lycopodium*, *gen. l.* *Id.* 2. 267, (1843); *Art. Phlegm.* *Id. Id.* 362, (1844); *Id.* *Id.* 362, (1844); *Id.* *Id.* 362, (1844).

DIAGNOSIS.—*Lycopodium* *Arifolium*, with 1-3-celled axillary spore-cases, and the reproductive bodies all of the same nature.

Usually moss-like plants, with creeping stems and imbricated leaves, the axis composed of one solid cord of annular vessels, or of a reticulated column of such vessels (constructed by cellular tissue); or stemless plants, with erect subulate leaves, and a solid corn. Spore-cases 1-3-celled, axillary,

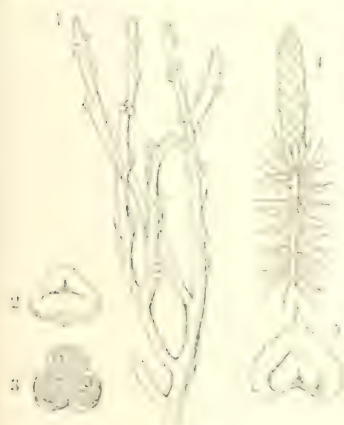


FIG. XLVI.

cases, this opinion is entirely conjectural, and founded upon no direct evidence; all that we really know is, that the larger bodies do germinate, and, if we are to credit Wahlenow, the powdery particles grow also. He says he has seen them. I find it a difficulty to be doubted that the latter are the abortive state of the former. I do, however, have quite a different view of the matter, and regards the larger bodies as Anthridia, while the smaller he calls spores. (*Ann. Bot. Abhandl.* fasc. 4. t. 4.) According to Salisbury, in the *Linnean Transactions*, vol. 12, tab. 19, *Lycopodium denticulatum* emits two cotyledons upon germinating; but, supposing this observation, which requires confirmation, to be exact, it is much more probable that the two little scales so emitted are primordial leaves than analogous to cotyledons. The genus *Phlegmossus* is remarkable for having the foliage, and mode of growth of Isoetes combined with the fructification, of a *Lycopodium*; and often a second argument



FIG. XLVII.

Fig. XLVI.—1, *Bernhardia denticulata*; 2, its spore-case; 3, the same, but showing the embryo; 4, *Lycopodium denticulatum*; 5 its spore-case, with the scale, to which it is axillary.

Fig. XLVII.—1, Spore-case of *Lycopodium denticulatum*; 2, *Bernhardia*; 3, spore-case of



to those who would place the former genus in this natural order. It is said to have quite the appearance of *Plantago pusilla*.

According to Ad. Brongniart, the stem of a *Lycopodium* is almost identical, anatomically, with the root of Ferns.

In geographical distribution these follow the same laws as Ferns, being most abundant in hot humid situations in the tropics, and especially in small islands. As they approach the north they become scarcer; but even in the climate of northern Europe, in Lapland itself, whole tracts are covered with *Lycopodium alpinum* and *Selaginoides*.

The powder contained in the spore-cases of *Lycopodium clavatum* and *Selago* is highly inflammable; shaken out and collected it is employed under the name of Lycopode, or vegetable brimstone, on the Continent, in the manufacture of fireworks, and in pharmacy to roll up pills, which when coated with it may be put into water without being moistened. The plant of *Lycopodium clavatum* has long been used as an emetic, and that of *L. Selago* as a cathartic; but it is said that if the dose is not small it is followed by faintness and convulsions; it is regarded as a powerful irritant, and has been externally employed for keeping blisters open, and as a counter-irritant in cases of inflamed eyes. The most remarkable plant of the order, however, is the Yatum condenado (Yatum Great Devil, and condenado accursed,) which appears to be the *Lycopodium rubrum* of Chamisso. Sir W. Hooker, who calls it *L. catharticum*, states that it acts most vehemently as a purgative, and has been administered successfully in Spanish America in cases of elephantiasis. According to Vastring, Clubmosses are likely to become of importance in dyeing; he asserts, that woollen cloths boiled with *Lycopodiums*, especially with *L. clavatum*, acquire the property of becoming blue when passed through a bath of Brazil wood. *Lycopodium Phlegmaria* is reputed an aphrodisiac. So also the rock-lily, a name sometimes given to *Selaginella convoluta*, Spring, also called *Lycopodium squamatum*, a plant remarkable for its hygrometrical properties, rolling up into a ball when dry and unrolling again when damped, is asserted by Martius, who found it abundantly in the provinces of Bahia and Pernambuco, to act upon the mucous membrane, especially of the uropoetic system. "Potentiam virilem amissam ejus decocto reduci posse perhibent, quo jure nescio." He, however, advises a full trial to be made of these and the East Indian species.



Fig. XLVIII.

#### GENERA.

*Tmesipteris*, Bernh.  
*Psilotum*, Swartz.  
*Isoetes*, Willd.  
*Hoffmannia*, Willd.

*Tristeca*, Palis.  
*Lycopodium*, Linn.  
*Selago*, Hook et Gren.  
*Huperzia*, Bernh

*Lepidotis*, Palis.  
*Chenopodium*, Mart.  
*Selaginella*, Spring.  
*Stachygynandrum*, Ps.

*Diplostachyum*, Palis.  
*Gymnogramma*, Palis.  
*Phylloglossum*, Kunze

NUMBERS. GEN. I. Sp. 200. (Hooker.)

#### Coniferae.

POSITION.—Ophioglossaceae.—LYCOPODIACEÆ.—Marsileaceae.

Fig. XLVIII. —*Lycopodium apiculatum*—after Payer.

Spring Monographie de la famille des Lycopodiacees, 4to. Brussels, 1842-49. Karl Müller in Botan. Zeitung, July 31, 1846.

The following ample account of modern attempts to explain the nature of the reproductive organs of Lycopods is condensed from Mr. Henfrey's valuable report, to which I am already so much indebted:—

The fructification of this family consists, as is well known, of spikes clothed with fruit-leaves, bearing on their inner faces sporangia containing spores. These spores are of two kinds. One sort occur in large numbers in their sporangium, and are very small; the others are much larger, and only four are met with in a sporangium. Spring, who has devoted great attention to the general characters of the Lycopods, has given especial names to the two kinds of spore-cases; those with the four large spores he calls oophorids, those with the small spores antherids; but he did not mean to attribute a sexual antithesis, merely a morphological one, as he expressly states.



The general impression with regard to the import of the two kinds of spores has long been, that the large spores alone are capable of producing new plants, and two years ago, Dr. C. Müller published a memoir, of which the following are the principal results:

The large spores are more or less globular bodies, usually flattened on the margins in which they are in contact with the opposite wall, thus, while the outer side has a spherical surface, the inner side has three or four triangular surfaces, as in *L. selaginella* and *L. denticulatum*. They possess two coats, the outer very thick, and composed of numerous cells, the cavities of which are almost completely filled up by deposits of secondary layers. This outer coat exhibits various forms of round markings on its outer surface, and in some cases these seem to form a distinct layer—a kind of cuticle, capable of being separated from the subjacent cells. The inner coat of the spore is usually perfectly structureless, and not very firmly attached to the outer coat. In *L. gracillimum* Dr. Müller observed below the outer coat a structure composed of a layer of rather large parenchymatous cells, which could be easily isolated; and as there was no structureless membrane within this, he regarded this layer as the proper inner coat. This observation is important in relation to the discrepancies between Müller's statements and those of Mettenius, to be spoken of presently. The cavity of the spore is filled with granular material.

When the spore is placed in favourable circumstances for germination it begins to swell up, and if the contents be examined with the microscope, a few minutes only will soon be found to have become developed in the interior. This cell formation commences at a determinate spot upon the inner coat of the spore, the cells being so firmly applied that they appear blended with this inner membrane. This cell formation goes on till an obtuse conical process is developed, which breaks through the outer tough coat of the spore, and this process is recognized as the germinal body or *Körper*, corresponding to the pro-embryo of the other Cryptogams. From this point, at this period does not by any means fill the cavity of the spore with its lower part, an ovate process is produced, at first obliquely directed upwards, the base of the future stem, and a conical process taking the opposite direction representing the radicle. On the ascending process a distinction can soon be observed between the terminal bud, a little oval body, and a short thread-like stem on which it is supported, as the bud opens, the leaves appear in pairs.

With respect to the import of the spores, Müller says: "Up to the present time it remains doubtful what purpose is served by the antherid spores. Some persons maintain one opinion, others another. One author declares he has seen it germinate, another that he has never been able to do so. Kaulass relates that Fürsch and L. Selagin, and Lindsay *L. cernuum* with success, and that *L. clavatum* sprung up abundantly with Willdenow. With himself it did not succeed; but the packing inspector, Otto of Berlin, raised *L. pygmaeum* several years in succession from seed. The last case, however, is readily explicable, since *L. pygmaeum* possesses antherids." Göppert states that he has seen the development of young plants from antherid spores in *L. denticulatum*. Müller, however, doubts whether the observation was that of Göppert never mentions seeing a young plant actually adherent to an antherid spore, and the young plant he figures closely resembles a *Fissidens*. In his own attempts to raise plants from antherid spores, Müller in every case failed. He does not deny, however, that they may be capable of germination, especially as some *Fissidens* seem to be devoid of oophorids.

In 1842 appeared M. Hofmeister's notice on the fructification and germination of the higher Cryptogams, in which he indicated the existence of the proembryo of *Selaginella*, of a number of peculiar organs, composed of three papilliform cells, enclosing a large globular cell in the centre. In one of these large spherical cells the young plant is produced.

In 1850, Mettenius published an essay on the Propagation of the Fossile Cryptogams, and in this is to be found a full description of the organs mentioned by Hofmeister, but overlooked by C. Müller. According to this notice, the large spores of *Selaginella involvens* possess two coats, each composed of two layers, and at an early stage of the germination, the inner layer of the inner coat, swelling with the inner coat, form the walls of a globular body which does not wholly or scarcely enclosed by the outermost membrane. This globular body is loosely attached to the outer membrane immediately under the point of junction of the three ridges separating the flattened surfaces of the inner coat of the spore. The proembryo remains until its walls come to be applied closely to the outer layer, completely filling up the large cavity. Then between the two layers of the inner coat, at a point immediately beneath the point of junction of the three external ridges, a process of cell formation commences, producing a flattened plate of tissue, interposed between the two layers.



this structure is the pro-embryo. The cells are at first in a single layer, but the central ones soon become divided by horizontal septa, so as to produce a double layer, and finally, four or more tiers of cells one above another. The outline of the pro-embryo, seen from above, is cellular, spreading over the upper part of the spore. On its surface appear the so-called ovules. The first is produced at the apex of the pro-embryo; the rest, to the number of twenty or thirty, arranged upon its surface in three lines corresponding to the slits by which the outer coat of the spore bursts. These ovules, closely resembling those of *Salvinia*, *Pilularia*, the Ferns, &c., consist of a globular cell, surmounted by four cells, which rise up into four papillæ, and leave a canal, or inter-cellular passage between them, leading down to the globular cell or embryo-sac. The four cells are usually developed into four or five cells, one above the other, by the production of horizontal septa; sometimes they are developed unequally, and to a considerable extent, so as to form papillæ, presenting an orifice between them at some point on the outer surface, indicating the canal leading down to the embryo-sac.

During the development of the ovules, a delicate parenchyma is produced in the great cavity of the spore, finally entirely filling up this spore. Before it has completely filled it, the embryo makes its appearance in the embryo-sac of one of the ovules.

The first change in this sac is the appearance of a nucleus; from this cells are developed representing the suspensor of the embryo. The cells of the suspensor multiply and form the process which penetrates down into the parenchyma of the cavity of the spore; at the lower end may be detected the embryo, a minutely cellular body. Dr. Mettenius never saw the embryo produced in the embryo-sac before the suspensor had broken through the bottom of it to penetrate the parenchyma of the spore-cell; it was always within this parenchyma, and attached to the end of the suspensor. In this point he is decidedly opposed to Hofmeister, who states that the embryo originates in the embryo-sac, whence a young embryo attached to its suspensor may easily be extracted from the spore.

The part of the embryo opposite to the point of attachment of the suspensor corresponds to the first axis of the *Rhizocarpeæ*, which never breaks out from the spore-cell in *Selaginella*; it pushes back the loose parenchyma of the spore-cell as it becomes developed, and when completely formed, is surrounded by a thin coat composed of several layers of the parenchymatous cells much compressed, enclosed in the still existing inner coat of the spore. On one side of the point of attachment of the suspensor the embryo grows out towards the point where the spore-cell has been ruptured, thus apparently in a direction completely opposite to the end of the axis. As it enlarges, it produces in this situation the leafy stem growing upwards, and the adventitious root turning downwards. The pro-embryo is at first distended like a sac, and finally broken through on the one side by the first leaf, on the other by the adventitious root; upon it may be observed the numerous abortive ovules, with their embryo-sacs filled with yellow contents; part of its cells grow out into radical hairs. Dr. Mettenius several times saw two young plants produced from one spore; the ends of their axes lay close together, and separated inside the cavity of the spore. No account is here given of the characters exhibited by the small spores, or of anything like a process of fertilization; yet there is indicated in the foregoing description of the so-called ovules, a clear analogy between these bodies and the so-called ovules of the Ferns and *Rhizocarpeæ*. These points will be referred to again at the close of the report. Hofmeister further states that spiral filaments are produced from the small spores of *Selaginella*, but he does not say that he has seen them, or give any authority. So far Hentfrey.

Mr. Thuret reports (*Recherches sur les Zoospores des Algues, &c.* p. 81) that he has often tried to make the spores of *L. clavatum* and *inundatum* grow, but could never succeed, any more than with those of Adder's-tongues (*Ophioglossaceæ*), which are very analogous to those of Lycopods. "Must we then conclude," he says, "with M. Spring, that these genera consist exclusively of males? I would prefer to suppose that the true fructification of these plants still remains to be discovered."

(See also page 53 d.)



ORDER XXII. MARSHALLACEÆ. *Proctosyllis*, and *Rufocoryphæ*[illegible]

DIAGNOSIS.—*Lycopodium Anatum*, with mostly rolled radicle specimens, and the presence of two different kinds.

Stemless plants, creeping, or floating; leaves usually stalked, sometimes keeled and scaly, occasionally destitute of lamina, and rolled up in veneration. Reproductive organs enclosed in involucre, and of two kinds; *the male*, clustered at the stalked base of the leaf, fusedly without stalks, and distinct from the seed, or mixed with it, or by some with it; *the female*, simple oval bodies, sometimes having a terminal nipple, that at the germination uniformly proceeds. [Stem and leaves filled with longitudinal tubes. A central simple fascicle of vessels composed of scabiform thicks and phloem, enclosing in the middle a quantity of elongated cells containing starch. Lenticular nerves, veins and stomates. *Morita*.]

The Order to which *Ptilodonta* and *Marsilea* belong consists of floating or creeping plants, often having the circinate vernation of Ferns, with their reproductive organs in close cases, called involucre, springing either from the root, or from the petioles of the leaves. These involucre contain oval bodies of two kinds, one of which has been called anther, and the other capsule. Figures of *Marsilea vestita* and polycarpa have been published by Hooker and Greville, at p. 159 and 160 of their noble *Icones Fungorum*. From these, and the more detailed observations of Esprit Fabre, it is clear that the involucre of that genus consists of an involute leaf analogous to the carpellary leaf of flowering plants.

Esperling-Palm has also shown, (*Ann. S. N. Y.*, 2: 1-7, 1911, 9, 115 and 361, and 12, 255), that on the side of a marvellous card, which I regard with Brugès as a mirror, proceeding from the involucre when it opens, there are oblong plates bearing two sorts of bodies packed closely, sometimes intermixed, but sometimes separated, so that each occupies a different side of the plates (which are 5-6 cells). He regards these two sorts of bodies as authors and ovules, and says, that their mutual position is such that the side which bears the ovules is always that which bears the authors. The "ovules" are from 10 to 15 on each side, whitish, semitransparent, ovoid, obtuse at one end, and terminated at the other by a nipple. The 2 a

thers" are little flattened parallelopipedons, rounded at each end. "They consist of a membranous sac, very thin and transparent, in which you see numerous pollen grains. The latter are spherical or elliptical, often pointed on one side. When you crush them beneath the microscope, spermatogenous granules of extreme smallness are seen to come out." Germination of this species takes place, according to the same observer, from the nipple at the point. He thinks, that the two sorts of bodies are certainly anthers and ovules, because, if they are left longer in water they become yellow.

left apart in water they petrify, while, on the other hand, if mixed together in water, he has seen the sides of the "fountains" burst, and the "grains of

[illegible]



pollen" collect about the nipple at the surface of the water, after which the "ovules" fall to the bottom, where, at the end of seven or eight days germination commences. These observations, however, require to be repeated: for Braun (*Flora*, 1839, p. 297,) and Griffith each regards both sorts of bodies as sporules. Fabre's experiment calls to

mind those of Professor Savi of Pisa, upon *Salvinia*, another plant of this Order. He put into different vessels, 1st, the seeds alone; 2d, the male globules alone; and 3d, both mixed. In the first two vessels nothing appeared; in the 3d, the seeds rose to the surface of the water and fully developed. But Duverney has since published a dissertation upon this plant, in which he states that, having repeated the experiments of Savi, he has not obtained the same results, and that the seeds, when separated from the supposed male organs, developed perfectly.

The structure of *Pilularia* is analogous. From the very correct and careful observations of Valentine, (*Linn. Trans.* 18.483,) it has apparently been proved, that the so-called anthers of that plant are, as I formerly suggested, no-

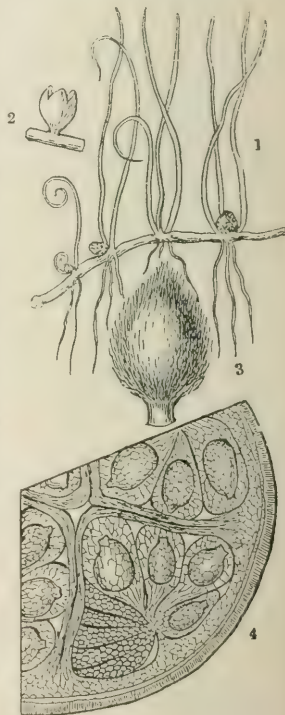


Fig L.

thing but abortive spores.

Follo wing Jussieu, *Salvinia* and *Azolla* were separated in the last edition of this work as a distinct Natural Order, a view that Endlicher has since taken. But upon a full consideration of the structure of these plants, or of what is known of it, it does not appear to justify the separation. Like *Pilularia* and *Marsilea*, they have two distinct kinds of reproductive bodies enclosed in involucre, and that seems to be the main feature by which *Pepperworts* are known as an Order from *Lycopodiaceæ*. For the same reason it appears better to combine with them *Isoetes*, instead of regarding that too as the type of still another Order. Mr. Griffith does not include *Isoetes* among these plants; but I cannot assent to the propriety of erecting every genus in this curious Order into a Suborder.

The genera *Salvinia* and *Azolla* have been the subject of some elaborate observations by Mr. Griffith, (*Calcutta Journal*, vol. v.), who elevates each into a Suborder, and throws an entirely new light upon their structure. He regards them as having true sexes, the male being certain necklace-shaped threads found at an early stage, in contact with what he denominates an orthotropous ovulum. But strange to say, this so called ovulum, instead of giving birth to an embryo, becomes the parent of reproductive bodies of two totally different kinds, having not even the smallest resemblance the one to the other, although the matrix out of which they are evolved is identical at an early period of the organisation. I regret that Mr. Griffith's most curious memoir only reached me as this sheet was going to press, so that it was impossible to have cuts prepared to illustrate his observations, for which the reader is referred to the work above quoted. All I can do is to give in a note the substance of his descriptions of *Salvinia* and *Azolla*.\*



LI.

\* *Salvinia verticillata*.—Male organs? articulated hairs on the stalks of the ovula; each joint containing a nucleus and a brownish fluid; Ovula nearly sessile, concealed by the roots, and partly covered

FIG. L. — *Marsilea pubescens* in different states of germination; advancing from 1. the spore, up to 4. the perfect young plant.

FIG. LI. — 1. *Pilularia globulifera*; 2. spore-case, natural size, bursting; 3. the same younger and magnified; 4. a section of the spore-case, showing the large and small spores, (after Valentine).



Delile has published an account of the germination of *Isoteles* spores, from which it appears that its sporules sprout upwards and downwards, forming an intermediate aerial body, which ultimately becomes the stem, or embryo; but it is not stated whether the spores from which the ascending and descending axes take their rise are uniform. In following Mr. Valentine finds, that germination takes place invariably from a basal point. DeCk. points out the great affinity that exists between *Isoteles* and *Lycopodium*, particularly in the relative position of the two kinds of reproductive matter. In *Lycopodium* the sporangia the pulverulent spore-cases occupy the upper ends of the shoots, and the granular spore-cases the lower parts; while, in *Isoteles*, the former are found in the centre, and the latter at the circumference. If this comparison is good, it will afford some evidence of the identity of nature of these bodies, and that the pulverulent ones are at least not anthers, as has been supposed; for in *Isoteles* the pulverulent inner bodies have the same organization, even to the presence of what has been called their margin, as the outer granular ones; so that, if *Isoteles* has sexes, it will offer the singular fact of the anther having a stigma. The anatomy of *Isoteles* is described by Moench in the *Linnæa*, xiv. 131.

The Peppeworts evidently approach the Cladonomeæ through *Isoteles*, which sometimes is referred to the one Order, sometimes to the other. Their genus *Andropogon* appears to bring them into contact with *Jungermanniaceæ*. According to Mr. Griffith, *Marattia* evidently appears to connect *Salvinia* with Ferns; "its important difference from *Salvinia* consist in the capsules, which correspond to the secondary capsules of that family, being developed within the substance of a modified leaf, in their occurring mixed with each other, and in the spores of the pedicellate capsules not becoming imbedded in apparently cellular masses."

All are inhabitants of ditches or inundated places. They do not appear to be affected by climate so much as by situation, wherefore they have been detected in various parts of Europe, Asia, Africa, and America; chiefly however in temperate latitudes.

Uses unknown.

#### GENERA.

*Ptilularia*, Lam.  
*Marshallia*, Lam.  
*Isoteles*, Juss.  
*Zosteromelos*, Nees.

*Azolla*, Lam.  
*Ceratophyllum*, Raf.  
*Elodea*, Spence, Meyen.  
*Salvinia*, Michx.

*Isoteles*, Lam.  
*Cladonomea*, Will.

NUMBERS. GEN. 5. Sp. 24.

#### Flora.

POSITION.—LYCOPODIACEÆ.—MARSHALLACEÆ.—Jungermanniaceæ.

with hairs; tegument open at the top; mature reproductive organs solitary, or by means of a few, within the size of a pea, covered with brown rigid hairs. The upper ones of each raceme, and lowest of each general situation, contain innumerable spherical bodies, of a brownish yellow and reticulated surface, terminating capillary simple filaments. These again contain a soft white opaque body. The other, which occupies the lowest part of the raceme, and which is the first and often the only one developed, is more oblong, contains 6 or larger, oblong ovate bodies, on either side of a central line, of a colour brown, surface also reticulated. Each contains a large, imbedded, oval, light brown, of a chalky aspect: it is three lobed at the apex, and contains below this a cavity lined by a very thin stramine, filled with granular and viscid matter and oily globules.

*Isoteles pinnata*.—The growing points present a number of minute solitary filaments, the growing male-organs, which at certain periods may be seen passing into the female, the young becoming united into their component cells within the cavity of that body, a cavity of the size of a pea, situated on the stem and branches, one above the other, enclosed in a brownish membrane, which contains oblong ovate, with a conspicuous foramen and two lobes, attached to the base of which are two long narrow bristles; capsules of each pair either differing in which one the lowest one is larger, or in which one the globose—or both of either kind, generally perhaps the globose presenting the more distinct appearance of the foramen, and still enclosed in the brownish membrane, appear half encased in a small, light brown, oblong ovate capsule, open by circumference; with the apex separated by a cavity. These present the same general appearance contained in a fine membrane, the remains of the raceme on the membrane enclosed. The capsule is filled with elongated granular fluid, and surrounded by a mass of brownish yellow, which is slightly to the calyptra; on the surface of the brownish mass are a number of long, thin, yellow, very thin, very large, which when pulled away, separate with some of the membrane, and are attached to the capsule by a pedicel. The globose capsule has a rough surface from the presence of the membrane, which is very rough, and is many in number, spherical, attached by long, capillary, and often by short, simple, or branched receptacle; each contains two or three elliptical bodies, presenting a dark brown, and often a yellowish, rather form prolongations. In their substance may be seen the same granular and oily fluid.



Very full details respecting the structure of this order are given by Mr. Henfrey, whose report is here quoted almost literally :—

The spores of the *Isoëtes lacustris* are of two kinds, analogous to those of the Lycopods; both kinds being produced in spore-cases imbedded in the bases of the leaves, but the large spores are found in great numbers, not merely four in a sporangium as in the Lycopods. The development of the spores was little known until the publication of an essay on the subject in 1848, by Dr. C. Müller, forming a sequel to his researches on the Lycopods.

Müller compares the complete large spore, as discharged from the sporangium, to the ovule of flowering plants; and he describes it as a globular sac enclosed by three coats, which he names the primine, secundine, and the nucleus. The outermost coat, or primine, is stated to be composed of a thick cellular membrane exhibiting a raised network of lines, which give it the aspect of a cellular structure, but are in reality analogous to the markings on pollen-grains. The outer surface exhibits the lines indicating the tetrahedral arrangement of the spores in the parent cell, as in *Selaginella*, and it is at the point of intersection of these that the membrane gives way in germination. The next coat, or secundine, is another simple membrane lining the first. The nucleus is a coat composed of delicate parenchymatous cells, but among these are found groups of peculiar character. These are described as consisting of a large cell divided by two septa crossing each other at right angles, projecting from the general surface, being either oval in the general outline, or having four indentations opposite the cross septa, so as to give the appearance of the structure being composed of four spherical cells. The cells surrounding them are of irregular form, different from the generally six-sided cells of the rest of the nucleus. Many of these groups occur on the nucleus, always at the surface of the coat where the primine and secundine afterwards give way, scattered without apparent order over it, but one always near the point of the opening. To these structures Dr. Müller did not attribute any important function, explaining them merely as produced by peculiar thickenings of the tissue to protect the pro-embryo during germination. The contents of the nucleus were stated to resemble those of the cavity of the spores of *Selaginella*.

In these contents, which become dense and mucilaginous, a free cell is developed near the upper part of the cavity; this is the rudiment of the embryo, and by cell-multiplication it becomes a cellular mass, which soon begins to exhibit growth in two directions, producing the first leaf and the first rootlet, projecting from a lateral cellular mass, which the author calls the "reservoir of nutriment." The embryo then breaks through the coats, the first leaf above, and the first root below, the coats remaining attached over the central mass of the embryo. The subsequent changes need not be mentioned here, further than to state that the leaves succeed each other alternately, and are not opposite, as in the Lycopodiaceæ; moreover, no internodes are developed between them, so that the stem is represented by a flat rhizome, like the base of the bulk of many Monocotyledons.

In the paper by Dr. Mettenius, already alluded to, we find some very important modifications of, and additions to, this history of development of the spores of *Isoëtes*, bringing them into more immediate relation with the other vascular Cryptogams.

This author describes the spore-cell as a thick structure, composed of several layers; in some cases he counted four. It completely invests the pro-embryo, which is a globular cellular body filling the spore-cell. Among the cells of the outermost layer of the pro-embryo (which layer forms the nucleus of Dr. Müller), on the upper part, are produced the ovules, fewer in number than in *Selaginella*, arranged in three rows converging upon the summit of the spore, these rows corresponding to the slits between the lobes of the outer coat of the spore. The four superficial cells of the ovules (which are evidently the peculiar groups mentioned by Müller, and previously noticed by Valentine) grow much in the same way as in the *Rhizocarpeæ* and in *Selaginella*, into short papillæ. The embryo is developed in the substance of the pro-embryo, displacing and destroying its cells, and a globular portion (corresponding to the "reservoir of nutrition" of Müller) remains within the spore after the first leaf and rootlet have made their way out. This body is the analogue of that portion of the embryo of *Selaginella* which penetrates into the cavity of the spore, and to the end of the first axis in the *Rhizocarpeæ*.

The most important point, however, of Dr. Mettenius's researches relates to the phenomenon exhibited by the small spores. In the water in which the spores were sown, he observed moving spiral filaments resembling those of the Ferns. He was not able to trace all the stages of development of these spiral filaments from the small spores, but he obtained nearly all the evidence relating to their origin which Nageli has done in reference to the similar organs in the *Pilularia*. In the small



spores minute vesicles are produced of varying size and number, some thin-walled, the outer coat. The inner coat or spore-wall breaks through the outer coat either in the middle or at both ends at the protruding poles, by which they are separated in contact with the other spore-walls. The contents are expelled, or it is found by finding numerous empty membranes. The external vesicles are not with an indefinite number in the water, and contain one large or several small granules and so forth. Some the spiral filaments are apparently produced; but the actual course of development was not observed. In one case a spiral filament was seen half way out of the spore-cell in active rotation, finally emerging completely, so that the issuing spiral filaments are probably developed in the vesicles, while those are still contained within the spore-cell. No actual connexion of these issuing spiral filaments or granulations with the so-called ovules has yet been traced.

In 1843 Schleiden announced that he had observed a process of impregnation in *Pilularia* in which the small spores acted the part of pollen-grains, producing tubes which entered into a cavity on the surface of the large spore or "ovule," and in accordance with his views of impregnation in general, became the embryo.

"After the ripe spores have had a longer or shorter time in water, a process of cell-formation commences at that point of the spore within the proper, lateral spore-cell, whence results the formation of a cellular body occupying only a small portion of the internal cavity of the spore. The cells multiply regularly, and pass through the exine, appearing externally as the green cellular papilla called *viv. Rahn* 'waist' by Eschsch, the 'papilla of the nucleus' by Schleiden. Two on ground why this should be named otherwise than as the pro-embryo. In *Pilularia* it is very soon seen,—where the pro-embryo consists of only about thirty cells, completely enveloped by the exine, and where the only external evidence of its existence is a little protuberance,—that the pro-embryo consists of a large central cell surrounded by a simple layer of smaller ones. The smaller cells covering the apex of the large cell, four in number, elongate into a papilla before the pro-embryo bursts through the exine, which splits regularly into twelve to sixteen teeth; subsequently these become divided by horizontal walls, and then appear as the organ which Schleiden, and after him Mettenius, supposed to be pollen-tubes produced from some of the small spores. These papilliform cells most certainly originate from the pro-embryo, a fact which takes away all material ground from Schleiden's theory.

"The four papilliform cells separate from each other, and leave a passage leading to the large central cell. In this cell the young plant originates shortly after the small spores, which never produce pollen-tubes, begin to emit the cellular contents spiral filaments discovered by Nageli. I observed and dissected out an embryo consisting of only four cells. It completely filled the large central cell, and there was not the least trace of a pollen-tube attached to it.

"The organization of *Salvinia* is somewhat different from this. On every pro-embryo, several, as many as eight cells of the outer surface of the cellular layer are, but two to the dense triangular cellular body, acquire a considerable size, a spherical form, and become filled with protoplasm. The four cells covering each of these large cells lose the greater part of their chlorophyll, and separate from each other to leave a passage leading down to the large central cell. In this large cell the young plant originates. The number of these organs in *Salvinia* allows the possibility of the occurrence of polyembryony in this genus. I observed two embryos on one pro-embryo in one case.

"It is out of the question to talk of a 'larger pollen-tube' in *Salvinia*. Mettenius has already shown that the structure of the small spores renders such a process from them impossible."

Dr. Mettenius's Essay on the vascular *Cryptogams*, recently frequently referred to, confirms the preceding account in all essential points, most slight differences excepting only to the structure of the coats of the spores; and it adds a description of the development of the "ovules" in the pro-embryo of *Marattia* Fries, which agrees closely with that in *Pilularia*. Hofmeister has recently announced the discovery of the production of cellules containing spiral filaments from the small spores of *Marattia*, just as Nageli saw them in *Pilularia*.



# ALLIANCE VI.—FILICALES.—THE FILICAL ALLIANCE.

Filices, *Juss. Gen.* 14. (1789); *Swartz Synops. Filicum* (1806); *Willd. Sp. Pl.* vol. v.; *R. Brown Prod.* 145; *Agardh Aph.* 115. (1822); *Kaulfuss Enum.*; *Hooker and Greville Icones Filicum*; *Blume, Fl. Javae*; *Schott's Genera Filicum*; *Mohl et Martius Plantæ Cryptogamicæ Brasilienses*, p. 40. (1834); *Hooker Species Filicum*; *Brongniart, Vég. Fossiles*, p. 141; *Presl, Tentamen pteridographiæ*; *J. Smith in Hooker Journ. Bot.*; *Endl. gen.* p. 58; *Hooker and Bauer, Genera Filicum*; *Link, Filicum Species.*

DIAGNOSIS.—*Vascular Acrogens, with marginal or dorsal one-celled spore-cases, usually surrounded by an elastic ring; and spores of only one kind.*

These are leafy plants, producing a rhizome, which creeps below or upon the surface of the earth, or rises into the air like the trunk of a tree; this trunk consists of a woody cylinder, of equal diameter at both ends, growing at the point only, containing a loose cellular substance which often disappears; it is coated by a hard, cellular, fibrous rind, which is much thicker next the root than at the apex, and it is itself composed of the united bases of leaves. Wood, when present, consists almost exclusively of large scalariform or dotted ducts, imbedded in hard plates of thick-sided elongated tissue, which usually assumes an interrupted sinuous appearance, but occasionally, according to Brown, forms a complete tube in *Dipteris*, *Platyzoma*, and *Anemia*. Leaves coiled up in veneration, with annular ducts in the vascular tissue of their petiole, either simple or divided in various degrees, traversed by simple, dichotomous, or netted veins of equal thickness, which are composed of elongated cellular tissue, with occasional ducts; cuticle frequently with stomates. Reproductive organs consisting of spore-cases arising from the veins upon the under surface of the leaves or from their margin, either pedicellate, with the stalk passing round them in the form of an elastic ring, or sessile and destitute of such a ring; either springing from beneath the cuticle, which they then force up in the form of a membrane (or indusium), or from the actual surface of the leaves. Spores arranged without order within the spore-cases. Sometimes the leaves are contracted about the cases, so as to assume the appearance of forming a part of the

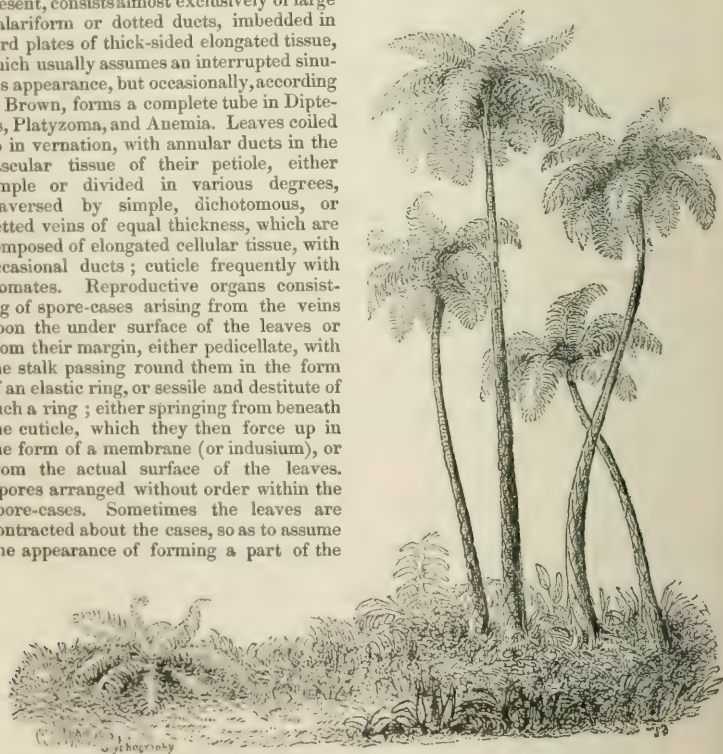


Fig. LII.

reproductive organs, and sometimes the place of spore-case is supplied by the depauperated lobes of the leaves.

The plants called Ferns are the most gigantic of Acrogens, sometimes having trunks forty feet high. They approach Flowering classes by *Cycadaceæ*, which may be considered to have much affinity with them, on account of the imperfect degree in which the vascular system of that Order is developed, of their pinnate leaves with a gyrate veneration,

Fig. LII.—Tree-Ferns, from *Blume*.



and their naked ovules borne upon the margin of contracted leaves, as the sporophores of Ferns are upon the leaves of *Osmunda*. To *Coniopsis trivernensis* these often adhere very closely through Salisburia, whose leaves might be mistaken for those of a Fern. The affinity of Ferns with *Lepidodermis* consists in a want of flowers, and the presence of annular vessels, than in any similarity of habit. *Coniopsis* are mostly known by their axillary sporocases dehiscing by regular valves. *Peperomia* are very different, that it is difficult to find points of comparison between them, except the gyrate leaves of some of the genera.

The organ in Ferns which deserves the most particular attention is the theca, or case that contains the reproductive matter. By many it is termed ovipede; but almost kind of pericarp is essentially connected with the power of conveying forward, so that the male apparatus to the ovules, and implies the existence of a certain definite relation between the various parts that it contains, nothing of which kind is found in the sporocase of Ferns, it is not necessary to insist upon the impropriety of applying such a name. Easy as it is to show that the sporocase is not analogous to a capsule, it is far less so to demonstrate with what organs or modifications of organs it really has an analogy. I was not, indeed, aware that this had been attempted, all botanists seeming to consider it a special organ, until, in the *Outlines of the First Principles of Botany*, I ventured to hazard the following theory: "The thecae may be considered annular leaves, having the same gyrate mode of development as the ordinary leaves of the tribe; under each the petiole, the annulus the midrib, and the theca itself the lamina, the edges of which are united." I was led to this opinion, first, by the persuasion that there was no special organ in Ferns to perform a function which in flowering plants is executed by modifications of leaves; and, secondly, by the examination of viviparous species. Observation has shown us that the leaves of flowering plants have the power of producing buds from their margin or any point of their surface; and in certain kinds of ferns it has been found that they can produce flower-buds also. In Ferns, which are commonly subject to become viviparous, the young plants often grow from the same place as the sporocases, or from the margin; and in a viviparous Fern, of which a mural was given me by Dr. Wallich, the young plants form little clusters of leaves in the place of seed. Upon examining these young plants, it appears that the more perfect, though narrow, leaves are preceded by still more minute primordial leaves or scales, the cellular tissue of which has nearly the same arrangement as the cellular of the sporocase; and the resemblance between the midrib of one of these scales and the ring of a *Polypodium* is striking. It is, however, necessary to add, what is only implied in the little sketch from which the foregoing extract is taken, that this explanation applies only to the gyrate Ferns. With regard to those with striated sporocases, or with what is called a torus transverse ring, they may either be considered not to have the rudiment of a young scale, out of which the case is supposed to be formed, so much developed; or the case may be still considered a nucleus of cellular tissue, separating both from that which surrounds it and also from its internal substance, which latter assumes the form of sporules, in the same way as the internal tissue of an anther separates from the valves under the form of pollen. This conjecture seems confirmed by the anatomical structure of those striated cases which consist of a cluster of spore-like areas of cellular tissue at the base and apex, connected by extended cells of the same description, as in *Gleichenia*; and is far from being weakened by such cases as those of *Parkeria*. In *Ophioglossum* another kind of provision is made for the production of spores, which in that genus seem to have no sporocase beyond the involute contracted segments of the leaf which bears them. What are called the thecae in *Ophioglossum* seem more analogous to the involucre of *Marsilea*.

It has been thought that sexes occur in these plants, and different parts have been pointed out as the anthers; more especially little threads which contain a grumous matter, sometimes exuded in the form of a crust, and spring up among the sporocases. Some probability seems to have been given to the presence of anthers by what has been considered an occurrence of Mule ferns, principally belonging to the genus *Selaginella*, some account of which will be found in the *Botanical Chronicle* [1844, p. 386] but it does not appear to me that there is good evidence to show that such instances are



Fig. 103



connected with hybrid action; and I agree with Link, in his first view of the question that the function of the Antheridia *nondum sit perspecta et declarata*, an opinion which he has, however, since abandoned in favour of these bodies being anthers. They may be bodies analogous to anthers; but if so they have none of their structure.

Nägeli has lately mentioned that the spiral threads, with an active motion, already mentioned under Mosses, also exist in some Ferns. He found them abundantly in the germinating leaf of *Aspidium augescens*, and elsewhere, traced their development, and determined that they are produced among the earliest cells that go to the composition of a fern-leaf. (*See Schleiden and Nägeli, Zeitschrift für Wissensch. Bot. s. 1. 168. t. 4.*)

The stems of Ferns, when arborescent, are objects of great interest to the botanist, partly on account of their rarity, secondly, because of their singular structure, and especially because they offer the highest form of development in Flowerless Plants. It has not been till lately that they have been well understood; they have now, however, received full illustration from Mohl, in Martius's beautiful *Icones Plantarum Cryptogamicarum*. One of the most interesting of them is that of the Baranetz or Barometz, called also the Scythian Lamb, in which, by cutting off the leaves, except a small portion of the stalk, of a woolly-stemmed species, and turning it upside-down, simple people have been persuaded that there existed in the deserts of Scythia creatures half animal half plant.

The veins of the leaves of Ferns have been sometimes described as dichotomous; it is only, however, in a certain number that this peculiarity occurs. In some they are simple, in others they are collected in lozenge-shaped meshes, and in some they are still differently arranged. Langsdorf and Fischer seem to have been the first to pay attention to these peculiarities, which have been admirably applied to the characters of genera by Adolphe Brougniart and Presl, who have shown them to be of the first importance in distinguishing genera.

Bory de St. Vincent elevates Ferns to the rank of a class, intermediate between Monocotyledons and Acotyledons; but at the same time he attaches no importance to the descriptions of those writers who, having seen the germination of the sporules, have attempted to prove an identity between them and Monocotyledons in that respect. He justly observes, that the irregular unilateral scale which has been seen to sprout forth upon the first commencement of their growth is extremely different from the cotyledon of Monocotyledons, which pre-exists in the seed and never quits it, but swells during germination, and acts as a reservoir of nutriment for the young plantlet. He most properly regards it as an imperfectly developed primordial leaf.

In some modern books of Botany Ferns are broken up into several distinct natural orders, which in my opinion are not to be maintained. But it does appear that three essentially distinct groups exist among them. Of these the largest portion consists of what were once named "dorsiferous ferns," in all which the spore-case is furnished with an elastic ring or band; in two other groups, of inconsiderable extent, the spore-cases have no such band. In one of them the cases are often immersed in the tissue of the back of the leaf, and partially, or entirely, united by their touching edges into many-celled bodies; in the other, the spore-cases appear to be nothing more than an alteration of the edge of a contracted leaf. Hence arise the three following orders:—

#### NATURAL ORDERS OF FILICALS.

- |  |                       |
|--|-----------------------|
| <i>Spore-cases ringless, distinct, 2-valved, formed on the margin of a contracted leaf</i> . . . . . | } 23. OPHIOGLOSSACEÆ. |
| <i>Spore-cases ringed, dorsal or marginal, distinct, splitting irregularly</i> . . . . .             |                       |
| <i>Spore-cases ringless, dorsal, connate, splitting irregularly by a ventral cleft</i> . . . . .     | } 25. DANÆACEÆ.       |
|  |                       |

No part of Mr. Henfrey's report is of greater interest than his skilful description of the alleged facts published concerning Ferns by numerous modern observers; and although it is in some degree a repetition of what these pages already contain, yet it deserves to be quoted at length.

"This class formed, for a long time, the great stumbling-block to those who sought to demonstrate the existence of sexuality in the Cryptogamous plants. The young capsules were generally considered to be the analogues of the pistillidia of the Mosses, and the young abortive capsules, which frequently occur among the fertile ones, were supposed by some authors to represent the antheridia. Mr. Griffith, shortly before



his death, noticed a structure which he was inclined to regard as the antheridium, and attributed to certain of the filaments upon the pedicel.

In the year 1844, Professor Nageli published an account of his observations on the germination of certain Ferns, and announced the discovery of 'living spiral filaments' closely resembling those of the *Chlamydomonas*, on certain cellular structures developed upon the pro-embryo or cellular body first produced in the spore. It is not worth while to enter into an analysis of his observations, as they have since been clearly shown to have been very imperfect; it is sufficient to state that he described only one kind of organ, and from his description it is evident that he contradicted the conclusions since discovered, regarding them as different stages of one structure. The announcement of this discovery seemed to destroy all grounds for the assumption of distinct stages, not only in the Ferns but in the other Cryptogams, since it was argued that the existence of these cellular organs, producing moving spiral filaments, the so-called spermatozoa, upon the germinating fronds, proved that they were not to be regarded as in any way connected with the reproductive processes.

But an essay published by the Count Suminski in 1848 totally changed the face of the question, and opened a wide field for speculation and investigation on this subject, just as it was beginning to fall into disfavor. Count Suminski's paper gives a minute history of the course of development of the Ferns from the germination of the spore to the production of the regular fronds, and he found this development to exhibit phenomena as curious as they were unexpected. The cellular organs seen by Nageli were shown to be of two perfectly distinct kinds, and moreover to present structures which gave great plausibility to the hypothesis that they represented reproductive organs; moreover, this author expressly stated that he had obtained absolute proof of sexuality, by observing an actual process of fertilisation to take place in the so-called ova, through the agency of the spiral filaments or spermatozoa.

The main points of his paper may be briefly summed up as follows. The Fern spore at first produces a filamentous process, in the end of which all development goes on until it is converted into a Marchantia-like frond of small size and exceedingly delicate texture, possessing the hair-like reticle hairs on its under side. On this under side become developed, in variable numbers, certain cellular organs of two distinct kinds. The first, which he terms antheridia, are the more numerous and consist of somewhat globular cells, seated on and arising from single cells of the cellular Marchantia-like frond. The globular cell produces in its interior a number of minute vesicles, in each of which is developed a spiral filament, coiled up in the interior. At a certain epoch the globular cell bursts and discharges the vesicles, and the spiral filaments moving within the vesicles at length make their way out of them and swim about in the water, displaying a spiral or helical form, and consisting of a delicate filament with a thickened clavate extremity; this, the so-called head, being said by Count Suminski to be a hollow vesicle, and to be furnished with six or eight cilia, by means of which the apparently voluntary movement of the filament is supposed to be effected.

The second kind of organ, the so-called 'ovules,' are fewer in number and present different characters in different stages. At first they appear as little round vesicles in the cellular tissue of the proembryo, lying near its central opening on the under side. In the bottom of the cavity is seen a little platy cell, the so-called embryo-sac. It is stated by Count Suminski that while the ovule with the water, one or more of the spiral filaments make their way into the cavity, coming in contact with the central globular cell. The four cells bounding the mouth of the embryo-sac, and from the general surface into a blunt cone-like process, formed of four pointed cells arranged in a squarish form and leaving an intercellular canal leading down to the cavity below. These four cells become divided by cross walls, and from one of them the so-called ovule exhibits externally a cylindrical form, composed of three layers of cells, the uppermost of which gradually converge and close in the opening of the canal leading down between them. Meanwhile the vesicular head of one of the spiral filaments has penetrated into the globular cellule or embryo-sac, entered by several undivided multiplication, and in the course of time displays itself as the embryo, producing the first frond and the terminal bud whence the regular fern frond is developed. In considering the import of these phenomena, the author assumes the most liberal to be with the process of fertilisation in flowering plants, as described by Schleiden, regarding the production of the embryo from the vesicular head of the spermatozoa representing the production of the planerogamous embryo from the end of the pollen tube after it has penetrated into the embryo-sac.

The promulgation of these statements naturally attracted great attention, and since they appeared, we have received several contributions to the history of these remarkable structures, some confirmatory, to a certain degree of Suminski's views, others altogether opposed to them.



In the early part of 1849, Dr. Wigand published a series of researches on this subject, in which he subjected the assertions of Suminski to a strict practical criticism; the conclusions he arrived at were altogether opposed to that author's views respecting the supposed formation of the organs, and he never observed the entrance of the spiral filaments into the cavity of the so-called ovule.

"About the same time M. Thuret published an account of some observations on the antheridia of Ferns. In these he merely confirmed and corrected the statements of Nägeli respecting the antheridia, and did not notice the so-called ovules.

"Towards the close of the same year, Hofmeister confirmed part of Suminski's statements, and opposed others. He stated that he had observed distinctly the production of the young plant (or rather the terminal bud for the new axis) in the interior of the so-called 'ovule,' but believed the supposed origin of it from the end of the spiral filament to be a delusion. He regards the globular cell at the base of the canal of the 'ovule' as itself the rudiment of the stem, or embryonal vesicle (the embryo originating from a free cell produced in this), analogous to that produced in the pistillidia of the Mosses. He also describes the development of the ovule differently, saying that the canal and orifice are opened only at a late period by the separation of the contiguous walls of the four rows of cells.

About the same time appeared an elaborate paper on the same subject by Dr. Hermann Schacht, whose results were almost identical. He found the young terminal bud to be developed in the cavity of one of the so-called 'ovules,' which were developed exactly in the same way as the pistillidia of the Mosses. He stated, also, that the cavity of the 'ovule' is not open at first, and he declares against the probability of the entrance of a spiral filament into it, never having observed this, much less a conversion of one into an embryo.

"In the essay of Dr. Mettenius already referred to, an account of the development of the so-called ovules is given. His observations did not decide whether the canal of the 'ovule,' which he regards as an intercellular space, exists at first, or only subsequently, when it is entirely closed above. Some important points occur in reference to the contents of the canal.

"The contents of the canal in a mature condition consist of a continuous mass of homogeneous, tough substance, in which fine granules, and here and there large corpuscles are imbedded. It reaches down to the globular cell or 'embryo-sac,' and is in contact with this. This mass either fills the canal, or diminishes in diameter from the blind end of the canal down to the 'embryo-sac;' in other cases it possesses the form represented by Suminski, having a clavate enlargement at the blind end of the canal, and passing into a twisted filament below. In this latter shape, it may frequently be pressed out of isolated 'ovules' under the microscope, and then a thin transparent membrane-like layer was several times observed on its surface. In other cases the contents consisted of nucleated vesicles, which emerged separately or connected together.

"The embryo-sac consists of a globular cell containing a nucleus, and this author believes that the commencement of the development of the embryo consists in the division of this into two, which go on dividing to produce the cellular structure of the first frond.

"With regard to the contents of the canal the author says, 'Although I can give no information on many points, as in regard to the origin of the contents of the canal of the "ovule," yet my observations on the development of the "ovule" do not allow me to consider them, with Suminski, as spiral filaments in course of solution; just as little have I been able to convince myself of the existence of the process of impregnation described by that author. It rather appears to me that the possibility of the entrance of the spiral filaments and the impregnation cannot exist until the tearing open of the blind end of the canal in the perfectly-formed ovule, as after the opening of the so-called 'canal of the style, in the pistillidia of the Mosses.

"Another contribution has been furnished by De Mercklin (*Beobachtungen an dem Prothallium der Farrenkrauter*, St. Petersburg, 1850), the original of which I have not seen, but depend on analyses of it published in the *Botanische Zeitung*, and the *Flora* for 1851, and further in a letter from De Mercklin to M. Schacht, which appeared in the *Linnæa* at the close of last year. He differs in a few subordinate particulars from M. Schacht in reference to the development and structure of the *prothallium* or pro-embryo, and of the antheridia and spiral filaments; but these do not require especial mention, except in reference to the vesicular end of the spiral filament described by Schacht, which Mercklin regards as a remnant of the parent vesicle, from which the filament had not become quite freed. The observations referring to the so-called ovule and the supposed process of impregnation are very important; they are as follows:—



"1. The spiral filaments swarm round the 'ovule' in numbers frequently exceeding to one and the same organ.

"2. They can penetrate into the 'ovule'. This was seen only three times in the course of a whole year, and under different circumstances. Twice a spiral filament was seen to enter a still widely open young 'ovule'; then came to a state of rest, and after some time assume the appearance of a 'club-shaped head of hair' (p. 100). The third case of penetration occurred in a fully developed 'ovule' through its wall. It therefore does not seem to afford evidence of the import of the spiral filament into the interior of the possibility of the penetration.

"3. In the tubular portion of the 'ovule' almost by every case, peculiar club-shaped, granular, multilobed filaments occur at a distance from the spiral filaments, like the spiral filaments, acquiring a brown colour with iodine. These multilobed bodies sometimes exhibit a twisted aspect, an opaque nucleus, or a notched end, some peculiarities which seem to indicate the existence of an individual.

"4. These club-shaped filaments are swollen at the lower extremity, and have been found in contact with the 'embryo-sac' or 'prothallium' which forms the rudiment of the future frond.

"5. The spiral filaments, which cease to move and fall upon the prothallium, are metamorphosed, become granular and swell up."

"Hence the author deduces the following conclusions:—

"That these clavate filiform masses in the interior of the 'ovule' are transformed spiral filaments, which at an early period, while the ovule was open, have penetrated into it; which leads to the probability that—

"1. The spiral filaments must regularly penetrate into the 'ovules' and

"2. They probably contribute to the origin or development of the young frond (or embryo). In what way this happens the author knows not, and the opinions on this point given by Count Suminski remain unconfirmed facts."

"An important point in this essay is the view the author takes of the whole process of development in this case. He regards it as not analogous to the regeneration in the *Phanerogamia*, since the essential fact is not the development of a frond from one cell of the *prothallium*, which he considers to be merely one of the changes of the individual plant; while all the other authors who have written on the subject, with the exception of Wigand, call the first frond, with its bud and root, an *embryo*, and regard it as a new individual, or at all events a distinct member of a series of forms constituting collectively the representatives of the species.

"Finally, Hofmeister, in his notice of this essay in the '*Flora'* declares that the development of the so-called 'embryo,' or first frond, commences not by the division of the globular cell or 'embryo-sac,' but by the development of a free cell or 'embryo-vesicle' in this, like what occurs in the endosperm of the *Phanerogamia*, and he asserts that this is the first stage of development from the globular cell upon the vascular Cryptogams, including that found in the pistillium of the *Mosses*."

Long as this extract is, I have thought it desirable to insert it for the sake of the curious statements which it reports. It will, however, be apparent that in this case, as in that of *Lycopods*, there is no evidence that the organs called actual are really so. The argument used at p. 55 *et. passim* applies here with equal force.

Owing to the extreme difficulty of obtaining any reasonable evidence in regard to this alliance, founded upon mere peculiarities of the reproductive system it has been proposed by Presl, Ad. Brongniart, J. Smith and others, to take into account the peculiar arrangement of the veins. To this some object. The question has been very well discussed in a paper read in Feb. 1852, before the London Society, by Mr. Thos. Moore, who contended that whether groups called genera were based in consideration of the peculiarities of their venation or well as their habit, was a mere question of words. The constant and unvarying occurrence of parallel free veins and of reticulated veins in the primary groups of flowering plants, and the occurrence of intermediate smaller groups, in which peculiarities of venation are associated with other characters, were mentioned by him as important facts in support of giving prominence to the character of venation of the Fronds which the little variety offered by the aggregations of naked or covered sporophytes, which are here the only parts of fructification really available for generic definition, makes it a matter of necessity that other characters should be taken into account in the case of these lower groups of vegetation, than those employed amongst flowering plants, whose more perfect reproductive organs offer the diversity requisite for purposes of classification. The most available additional characters consist in the constant and unvarying diversities of the vascular structures, which, however, can be perfectly relied on; because, whatever modifications are presented in a particular species, are constant to that species. He therefore concluded that without overlooking



the importance of the fructification of Ferns, as affording distinguishing characteristics of generic groups, the modifications of venation might with convenience and propriety be admitted to share the same office ; and, according to this view, if two wild species presenting constant organic differences in fructification, should not be placed in the same genus, so neither should species presenting constant organic differences in the development of their vascular structure. The question "whether or not a reticulated venation is in itself a sufficient generic distinction among the Ferns," was answered by Mr. Moore in the affirmative, on the ground that, a genus being an arbitrary group, all that is required in a generic character is a constant difference from established genera in the structure or development of some important organ. The vascular system of plants is held to be of the highest importance in the vegetable economy, since it is not unfrequent—and more common among Ferns than most other plants—to find such extraordinary means of propagation as adventitious buds, developed in connection with it. In Ferns, particularly those points of the veins which normally serve as the receptacles which bear the sort, in other cases become viviparous and develop geminae from which plants are ultimately produced. On these grounds and the peculiarities of venation exhibited by flowering plants, the author arrived, though with much deference, at a conclusion opposed to that of the botanists who exclude venation in Ferns from the sources available for generic distinction.



## Order XXIII. OPHIOGLOSSACEÆ.—Adders' Tongues.

*Ophioglossum*, R. Br. *t.* 12. (1810); *Linnaea*, *l.* 412. (1760). *Swartz*, *p.* 19. (1787).  
*Link.* *Travels*, *Seydlitz*, *p.* 131. (1801) *non* *Swartz*.

**DIAGNOSIS.** *Phyllid* *Acanthaceæ*, with *lingula*, distinct, 2-valved *sporangium*, *formed* on the margin of a contracted leaf.

Stem erect, or pendulous, with a cavity in the middle, instead of pith, and bearing three woolly bundles placed round it in a ring. Below, the scales of the leaves and the spikes become blended together. Leaves with netted veins sometimes forked. Sporangium collected into a spike formed out of the sides of a contracted leaf, 2-valved, without any trace of an elastic ring. Spores resembling fine powder.

These little plants exhibit a manifest transition to Clubmosses, with which they closely agree in the saccate nature of their sporangia; but in the latter they are sessile, while in the former they are planted on the margin of a contracted leaf. The curious little genus *Phyllidoglossum* seems to be an imitation among Clubmosses of the habit of Adders' tongues. Link finds, in the hollow stem, a central cavity is surrounded by woolly bundles, a structure intermediate between that of Clubmosses and Horsetails.

Adders' tongues are most abundant in the islands of tropical Asia, occurring however in the West Indies, and by no means uncommon in temperate latitudes of both worlds. In the tropical parts of Africa, and in Barbary, they seem unknown; at the Cape of Good Hope and in Tasmannia they are uncommon.

The herbage of the order is mucilaginous, whence the species have been employed in broths. *Ophioglossum vulgatum* and *Lunaria botryoides* have been used in medicine as vulneraries, but they seem to possess that quality as little as the magical virtues once ascribed to them. *Helminthostachys* is regarded in the Moluccas as a slight aperient, is used as a pot-herb, and its young shoots as a vegetable.

The Haytiens fancy *Botrychium cicutarium* to be an alexipharmic.

## GENERA.

*Ophioglossum*, Linn.  
*Ophiocleria*, Linn.  
*Helminthostachys*, Ait.

*Lunaria*, Pers.  
*Lygodes*, Desf.  
*Botrychium*, Swartz.

*Phyllidoglossum*, Hook.  
*Phyllidoglossum*, Hook.  
*Phyllidoglossum*, Hook.

NUMBERS. GEN. 4. Sp.

POSITION.—Polypodiæ (Osmundidæ). *Ophioglossum*, *Lunaria*, *Lygodes*, *Botrychium*.

FIG. LIV. *Ophioglossum vulgatum*, Swartz.



## ORDER XXIV. POLYPODIACEÆ.—FERNS.

*Gyrate*, Swartz *Synopsis Filicum*, (1806).—*Filices veræ*, Willd. *Sp. Pl.* 5. 99. (1816).—*Polypodiaceæ*, R. Brown *Prodr.* 145. (1810); *Aquedh Aph.* 116. (1822); *Kaulfuss Enumeratio*, 55. (1824); *Bory in Diet. Class.* 6. 586. (1824); *Martius Ic. Pl. Crypt.* 83. (1834).

DIAGNOSIS.—*Filical Acrogens*, with ringed spore-cases, growing on the back or edge of the leaves, distinct, and splitting irregularly.

The vast number of plants of the Filical Alliance, collected under this head, are so much alike in many respects, that to separate them into distinct natural orders seems to me contrary to all the rules that govern Botanists in their limitation of such groups.

The great mark by which they are known is the presence on the spore-cases of a ring or band of coarse meshes, distinctly different from the tissue of their sides, and too strong to be broken through when the case opens to discharge its contents. Whether the band is vertical or horizontal, complete, incomplete, or otherwise, seems unconnected with any physiological peculiarities that can be pointed out, and to be of no greater importance than for the subordinate purposes of classification. The order consists for the most part of species bearing their spore-cases on the back of leaves, usually named fronds; with the exception of the suborder called Hymenophyllæ, a group of thin, delicate, membranous species, whose leaves open their edges for the protrusion of a vein, over whose surface the spore-cases are arranged. But, independently of all other reasons for regarding the Hymenophyllæ as a mere form of the great order of Ferns, the existence of such genera as *Cibotium*, *Deparia*, &c., among Ferns not Hymenophylleous, forbids our attaching much importance to that peculiarity. A very remarkable deviation from the common plan of structure seems at first sight to occur in *Osmundæ* and *Schizææ*, in which the spore-cases are collected together upon contracted leaves, after the manner of the Adders' tongues; but such plants have no combining character, occurring among

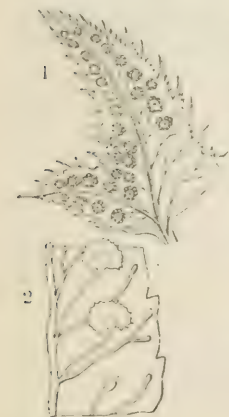


Fig. LV.

Hymenophyllæ as well. The passage of the true Ferns into neighbouring orders is not very gradual. If we regard them as resting on the one hand upon *Danæa*-worts, they can scarcely be said to touch Adders' tongues on the other, unless the great character of the ringed spore-cases is left out of consideration, and then *Osmundæ* may be taken as the connecting link.

The following proportions borne by Ferns to other plants in different latitudes will serve to give some idea of the manner in which they are geographically distributed. There is an enormous disproportion between Ferns and the rest of the Flora in certain tropical islands, such as Jamaica, where they are 1-9th of the Phænogamous plants; New Guinea, where D'Urville found them as 28 to 122; New Ireland, where they were as 13 to 69; and in the Sandwich Islands, where they were as 40 to 160; and it is clear, from the collections of Wallich, that Ferns must form a most important feature in the Indian Archipelago. Upon continents, however, they are far less numerous: thus, in equinoctial America Humboldt does not estimate them higher than 1-36th; and in New Holland Brown finds them 1-37th. They decrease in proportion towards either pole: so that in France they are only 1-63d; in Portugal, 1-116th; in the Greek Archipelago, 1-227th; and in Egypt, 1-971st. Northwards of these countries their proportion again augments, so that they form 1-31st of the Phænogamous vegetation of Scotland; 1-35th in Sweden; 1-18th in Iceland; 1-10th in Greenland; and 1-7th at North Cape. (See a very good paper upon this subject by D'Urville, in the *Ann. des Sc. Nat.* 6. 51.; also Brown's *Appendix to the Congo Voyage*, 461.) Brown has observed (*Flinders*, 584), that it is remarkable, that although arborescent Ferns are found at the southern extremity of Van Dieman's Island, and even at Dusky Bay in New Zealand,

Fig. LV.—1. Part of the leaf of *Aspidium Lonchitis*; 2. a magnified view of a morsel of *Asp. exaltatum*.



in nearly 40° south latitude, yet they have so far been found beyond the northern tropic. For an excellent account of the geographical distribution of *Trypoxys* and *Mesochorus* I would refer the reader to *Phylogenie der Hymenopteren*, p. 41.

The leaves generally contain a thick acrid mucus, which accounts many are considered pectoral and lenient, especially *Adiantum Capillus Veneris*, and *Capillus Veneris*; but almost any other may be substituted for them. *Capillus Veneris* is so called from being prepared from the *Adiantum Capillus Veneris*, a root which is considered to be undoubtedly pectoral and slightly astringent; though its action is strong, is, according to Ainslie, a certain emetic. The *Peruvum Polypodium*, *Cissampelos*, *Acrostichum Huasesar*, and *Polypodium crassifolium*, are said to be possessed of important medicinal properties, especially the former; their effects are reputed to be solvent, deobstruent, sudorific, and antirheumatic; antivenereal and febrifugal virtues are also ascribed to them. The leaves of *Adiantum melanosaurum* are believed to be a tonic in India. (*Linnæa*, 2, 215.) The tubes of the pipes of the Brazilian negroes are manufactured from the stalk of *Mertensia dichotoma*, which they call *Santamará*. The stem of many species is both bitter and astringent; whence that of several, especially *Aspidium Filix Mas*, and *Pteris aspidina*, has been employed as an anthelmintic, and *Notholaena pilosellodes* has been used in India to subdue spargings of the gums. They have also been given as emmenagogues and purgatives. *Osmunda regalis* has been employed successfully, in doses of 3 drachms, in the measles. The rhizome of *Nephrodium esculentum* are eaten in Nipal, according to Buchanan. *Diplazium esculentum*, *Cyathea medullaris*, *Pteris esculenta*, and *Glochia Herminia*, are also occasionally employed for food in different countries. Speaking of *Pteris esculenta*, the Tasmanian fern-root, Mr. Backhouse says, "Pigs feed upon this root where it has been turned up by the plough; and in sandy soils, they will themselves turn up the earth in search of it. The Aborigines roast it in the ashes, peel off its skin with their teeth, and eat it with their roasted kangaroos, &c. in the same manner as Europeans eat bread. The root of the Tara-fern possesses much nutritive matter; but it is to be observed, that persons who have been reduced to the use of it, in long excursions through the bush, have become very weak, though it has prolonged life." *Pteris aquilina* and *Aspidium Filix Mas* have been used in the manufacture of beer, and *Aspidium fragrans* as a substitute for tea. (*Accl.*) The fragrance which gives its name to the latter species occurs occasionally elsewhere. *Polypodium phytoides* is employed, along with *Angiopteris exsecta*, in preparing the esca native of the South Sea islands; *Ancimia tomentosa* smells of myrrh, and *Mohia tharifera* of benzoin.

## GENERAL.



LVI

1. — *Polysporus*. Fiedl.  
Gen. xvi. Spore cases  
stalked, with a vertical  
ring; spores roundish  
or oblong.
- Acrostichum*, L.  
*Polysporus*, H. B.  
*Phaeosporus*, Schott.  
*Ophiaria*, Raf. d.  
*Phaeosporium*, Schott  
*Phaeosporus*, Schott.  
*Stenodictya*, J. Sm.  
*Leptogium*, J. Sm.  
*Ascometis*, Presl.  
*Stenosmia*, Presl.  
*Campium*, Presl.

- Platyosorium*, Dur.  
*Alisma*, Gandlch.  
*Cyrtospermum*, J. Sm.  
*Platanostegia*, J. Sm.  
*Pseudocostaria*, Eschsch.  
*Ranalis*, Schott.  
*Gymnosporium*, Presl.  
*Hymenophyllum*, Kunt.  
*Leptochloa*, Kunth.  
*A. angustata*, Presl.  
*Hemionitis*, Liliac.  
*Antrophyum*, Kunth.  
*Lacocarpum*, Benth.  
*Polytaenium*, Dur.  
*Lanceolatum*, J. Sm.  
*Gymnogramma*, Desm.

- [illegible]

Fig. 1 VI - Schematic of the...



Hewardia, J. Sm.  
 Cassebeera, Kaulf.  
 Platyloma, J. Sm.  
 Doryopteris, J. Sm.  
 Pteris, Linn.  
 Allosorus, Bernh.  
*Centodactylis*, J. Sm.  
*Phorolobus*, Desv.  
 Amphiblestia, Presl.  
 Litobrochia, Presl.  
 Campteria, Presl.  
 Monogonia, Presl.  
 Jamesonia, Hook.  
 Salpichlaena, J. Sm.  
 Blechnum, Linn.  
 Sadleria, Kaulf.  
 Acropteris, Link part.  
 Haplopteris, Presl.  
 Lemaria, Willd.  
*Stegania*, R. Br.  
 Vittaria, Smith.  
 Struthiopteris, Willd.  
 Onoclea, Linn.  
 Angiopteris, Mitch.  
 Calypterium, Bernh.  
 Ragiopteris, Presl.  
 Neotopteris, J. Sm.  
 Asplenium, Linn.  
 Onopteris, Bernh.  
 Belvisia, Mirb. part.  
 Acropteris, Link.  
 Thannopteris, Presl.  
 Darea, Juss.  
 Caenopteris, Berg.  
 Hemidietyum, Presl.  
 Allantodia, R. Br.  
 Doodia, R. Br.  
 Woodwardia, Smith.  
 Scolopendrium, Smith.  
 Antigramma, Presl.  
 Camptosorus, Link.  
 Onychium, Kaulf.  
*Leptostegia*, Don.  
 Diplazium, Swartz.  
 Callipteris, Bory.  
 Anisogonium, Presl.  
 Digrammaria, Presl.  
 Oxysgonium, Presl.  
 Didymochlaena, Desv.  
*Monochlaena*, Gaud.  
*Hippodium*, Gaudich.  
*Tegularia*, Reinw.  
*Ceranium*, Reinw.  
*Hysterochloa*, Langs.  
 Nephrolepis, Schott.  
 Nephrodium, Rich.  
 Oleandra, Cav.  
 Neuronia, Don.

*Ophiopteris*, Reinw.  
 Dryopteris, Adans.  
*Lastrea*, Presl.  
 Thelypteris, Schott.  
 Arthrobotrys, Presl.  
*Aspidium*, Swartz.  
*Psilopodium*, Neck.  
 Polystichum, Roth.  
*Tectaria*, Cav.  
*Rumohria*, Radd.  
 Phanerophlebia, Presl.  
*Fadgenia*, Hooker.  
*Cyclodium*, Presl.  
 Cyrtomium, Presl.  
*Sagenia*, Presl.  
 Batium, Presl.  
 Cystopteris, Bernh.  
 Acrophorus, Presl.  
 ? *Leucostegia*, Presl.  
 Lindsaea, Dryand.  
 Schizolomia, Gaud.  
*Hymenotomia*, Gaud.  
 Isoloma, J. Sm.  
 Dictyoxiphium, Hooker.  
 Synaphlebium, J. Sm.  
 Odontosoria, J. Sm.  
 Davallia, Smith.  
 Microlepis, Presl.  
 Saccoloma, Kaulf.  
 Humata, Cav.  
 Pachypleuria, Presl.  
 Colposoria, Presl.  
*Wibelia*, Bernh.  
 Odontosoria, Presl.  
 Stenolobus, Presl.  
 Prosaptia, Presl.  
 Cystidium, J. Sm.  
 Dicksonia, Herit.  
 Balantium, Kaulf.  
 Culeita, Presl.  
 Sitolobum, Desv.  
*Densstaedtia*, Bernh.  
 Leptopleuria, Presl.  
 Pteris, Presl.  
 Pæsia, St. Hil.  
 Cibotium, Kaulf.  
*Pinonia*, Gaudich.  
 Deparia, Hook et Grev.  
 Woodsia, R. Br.  
*Physematum*, Kaulf.  
 Diacalpe, Blum.  
 Hymenocystis, C. A. Mey.  
 Hypoderris, R. Br.  
 Sphaeropteris, R. Br.  
*Peranema*, Don.  
 Podilema, R. Br.  
 Prionopteris, Wall.

II. — *Cyathea*, Kaulf.  
 Enum. (1824); spore-cases with a vertical ring, usually sessile, on a more or less elevated receptacle; spores 3-cornered or 3-lobed.

Thyrsopteris, Kunz.  
*Panicularia*, Coll.  
 ? *Chondia*, Molin.  
 Schizochlaena, J. Sm.  
 Hemitelia, R. Br.  
 Cnemidaria, Presl.  
 Alsophila, R. Br.  
 Haplophlebia, Mart.  
 Dicranophlebia, Mart.  
 Metaxya, Presl.  
 ? *Amphidesmum*, Scht.  
*Trichopteris*, Park.  
 Trichipteris, Presl.  
*Chanoophora*, Kaulf.  
 Arachniodes, Blum.  
 Gymnosphaera, Blum.  
 Cyathea, Smith.  
 Sphaeropteris, Bernh.  
 Schizocena, J. Smith.  
 Notocarpia, Presl.  
 Disphemia, Presl.  
 Cnemidaria, Presl.  
 Matonia, R. Br.

III. *Parkereæ*, Hooker, exot. fl. p. 147. (1825): spore-cases very thin, surrounded by a broad imperfect, sometimes obsolete ring.

Ceratopteris, Brongn.  
 Ellobocarpus, Kaulf.  
 Teleozoma, R. Br.  
 Cryptogenis, Rich.  
 Furcaria, Desv.  
 Cryptogramma, Grev.  
 Parkeria, Hooker.

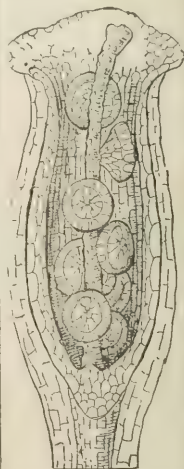


Fig. LVIII.

IV. *Hymenophylleæ*.  
 Endl. prod. Norf. 16. (1833); Martii ic. pl. crypt. 102. (1834);

Enall. Gen. xxxvii.—Spore-cases marginal, placed upon the surface of a vein extended beyond the edge of the leaf, with a complete horizontal ring; spores convexo-tetradral.

Hymenophyllum, Smith.  
 Trichomanes, Linn.  
 Didymoglossum, Desv.  
 Hymenostachys, Bory.  
 Feca, Bory.  
 Lecanium, Presl.  
 Cardiomanes, Presl.  
 Ragatellus, Presl.  
 Cephalomenes, Presl.  
 Neurophyllum, Presl.  
 Microgonium, Presl.  
 Abrodictyum, Presl.  
 Meringium, Presl.  
 Hemiphibium, Presl.  
 Leptocyonium, Presl.  
 Myrmecostylus, Presl.  
 Ptychophyllum, Presl.  
 Sphaerocydonium, Presl.  
 Hymenoglossum, Presl.  
 Loxsoma, R. Br.

V. — *Gleichenia*, Schismatopterides, Willd. l. c. 69. (1810).—*Gleichenia*, R. Br. l. c. 160. (1810); Kaulfuss l. c. 36. (1824).—*Bory*, l. c. (1824).—*Pleurogyrata*, Bernh.—*Gleicheniaceæ*, Mart. ic. pl. 105. (1834); Endl. gen. xxviii.; spore-cases dorsal, with a transverse occasionally oblique ring, nearly sessile, and bursting lengthwise internally; spores oblong, or kidney-shaped.

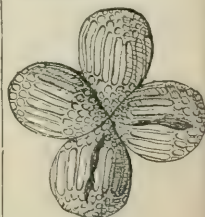


Fig. LIX.

*Gleichenia*, Smith.  
 Mertensia, Willd.  
 Dicranopteris, Bernh.  
 Sticherus, Presl.  
 Platyzoma, R. Br.  
 Calymnella, Presl.

VI. — *Schizææ*, Mart. ic. pl. crypt 113. (1834); Endl. gen. xxix.; spore-cases dorsal, with a complete terminal contracted ring; spores pyramidal or conical.

Aneimia, Swartz.  
 Ornithopteris, Bernh.  
 Anemidictyon, J. Sm.



Fig. LVII.

Fig. LVII.—*Antrophyum Lessonii*.

Fig. LVIII.—Spore-cases and cup of *Trichomanes radicans*.

Fig. LIX.—Spore-cases of *Mertensia flexuosa*.



Selkirk, Scott  
*Empidonax*, Gray  
*Turdus*, H.  
 Astor, Texas, 1904  
 1. *Empidonax*, H.  
*Empidonax*, W.  
*Empidonax*, H.  
 Ontario, Red  
*Empidonax*, M.  
 Ontario, H.

VII. — *Chrysomelidae*. — *Oncoscelus* (1818), *Reich.*  
161. (1818). — *Chrysomelidae*,  
p. 136. (1818). — *Reich.*  
162. p. 42. (1818).  
*Reich.* 163. p. 159.

1911-12, 1912-13, 1913-14, 1914-15, 1915-16, 1916-17, 1917-18, 1918-19, 1919-20, 1920-21, 1921-22, 1922-23, 1923-24, 1924-25, 1925-26, 1926-27, 1927-28, 1928-29, 1929-30, 1930-31, 1931-32, 1932-33, 1933-34, 1934-35, 1935-36, 1936-37, 1937-38, 1938-39, 1939-40, 1940-41, 1941-42, 1942-43, 1943-44, 1944-45, 1945-46, 1946-47, 1947-48, 1948-49, 1949-50, 1950-51, 1951-52, 1952-53, 1953-54, 1954-55, 1955-56, 1956-57, 1957-58, 1958-59, 1959-60, 1960-61, 1961-62, 1962-63, 1963-64, 1964-65, 1965-66, 1966-67, 1967-68, 1968-69, 1969-70, 1970-71, 1971-72, 1972-73, 1973-74, 1974-75, 1975-76, 1976-77, 1977-78, 1978-79, 1979-80, 1980-81, 1981-82, 1982-83, 1983-84, 1984-85, 1985-86, 1986-87, 1987-88, 1988-89, 1989-90, 1990-91, 1991-92, 1992-93, 1993-94, 1994-95, 1995-96, 1996-97, 1997-98, 1998-99, 1999-00, 2000-01, 2001-02, 2002-03, 2003-04, 2004-05, 2005-06, 2006-07, 2007-08, 2008-09, 2009-10, 2010-11, 2011-12, 2012-13, 2013-14, 2014-15, 2015-16, 2016-17, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23, 2023-24, 2024-25, 2025-26, 2026-27, 2027-28, 2028-29, 2029-30, 2030-31, 2031-32, 2032-33, 2033-34, 2034-35, 2035-36, 2036-37, 2037-38, 2038-39, 2039-40, 2040-41, 2041-42, 2042-43, 2043-44, 2044-45, 2045-46, 2046-47, 2047-48, 2048-49, 2049-50, 2050-51, 2051-52, 2052-53, 2053-54, 2054-55, 2055-56, 2056-57, 2057-58, 2058-59, 2059-60, 2060-61, 2061-62, 2062-63, 2063-64, 2064-65, 2065-66, 2066-67, 2067-68, 2068-69, 2069-70, 2070-71, 2071-72, 2072-73, 2073-74, 2074-75, 2075-76, 2076-77, 2077-78, 2078-79, 2079-80, 2080-81, 2081-82, 2082-83, 2083-84, 2084-85, 2085-86, 2086-87, 2087-88, 2088-89, 2089-90, 2090-91, 2091-92, 2092-93, 2093-94, 2094-95, 2095-96, 2096-97, 2097-98, 2098-99, 2099-00, 2100-01, 2101-02, 2102-03, 2103-04, 2104-05, 2105-06, 2106-07, 2107-08, 2108-09, 2109-10, 2110-11, 2111-12, 2112-13, 2113-14, 2114-15, 2115-16, 2116-17, 2117-18, 2118-19, 2119-20, 2120-21, 2121-22, 2122-23, 2123-24, 2124-25, 2125-26, 2126-27, 2127-28, 2128-29, 2129-30, 2130-31, 2131-32, 2132-33, 2133-34, 2134-35, 2135-36, 2136-37, 2137-38, 2138-39, 2139-40, 2140-41, 2141-42, 2142-43, 2143-44, 2144-45, 2145-46, 2146-47, 2147-48, 2148-49, 2149-50, 2150-51, 2151-52, 2152-53, 2153-54, 2154-55, 2155-56, 2156-57, 2157-58, 2158-59, 2159-60, 2160-61, 2161-62, 2162-63, 2163-64, 2164-65, 2165-66, 2166-67, 2167-68, 2168-69, 2169-70, 2170-71, 2171-72, 2172-73, 2173-74, 2174-75, 2175-76, 2176-77, 2177-78, 2178-79, 2179-80, 2180-81, 2181-82, 2182-83, 2183-84, 2184-85, 2185-86, 2186-87, 2187-88, 2188-89, 2189-90, 2190-91, 2191-92, 2192-93, 2193-94, 2194-95, 2195-96, 2196-97, 2197-98, 2198-99, 2199-00, 2200-01, 2201-02, 2202-03, 2203-04, 2204-05, 2205-06, 2206-07, 2207-08, 2208-09, 2209-10, 2210-11, 2211-12, 2212-13, 2213-14, 2214-15, 2215-16, 2216-17, 2217-18, 2218-19, 2219-20, 2220-21, 2221-22, 2222-23, 2223-24, 2224-25, 2225-26, 2226-27, 2227-28, 2228-29, 2229-30, 2230-31, 2231-32, 2232-33, 2233-34, 2234-35, 2235-36, 2236-37, 2237-38, 2238-39, 2239-40, 2240-41, 2241-42, 2242-43, 2243-44, 2244-45, 2245-46, 2246-47, 2247-48, 2248-49, 2249-50, 2250-51, 2251-52, 2252-53, 2253-54, 2254-55, 2255-56, 2256-57, 2257-58, 2258-59, 2259-60, 2260-61, 2261-62, 2262-63, 2263-64, 2264-65, 2265-66, 2266-67, 2267-68, 2268-69, 2269-70, 2270-71, 2271-72, 2272-73, 2273-74, 2274-75, 2275-76, 2276-77, 2277-78, 2278-79, 2279-80, 2280-81, 2281-82, 2282-83, 2283-84, 2284-85, 2285-86, 2286-87, 2287-88, 2288-89, 2289-90, 2290-91, 2291-92, 2292-93, 2293-94, 2294-95, 2295-96, 2296-97, 2297-98, 2298-99, 2299-00, 2300-01, 2301-02, 2302-03, 2303-04, 2304-05, 2305-06, 2306-07, 2307-08, 2308-09, 2309-10, 2310-11, 2311-12, 2312-13, 2313-14, 2314-15, 2315-16, 2316-17, 2317-18, 2318-19, 2319-20, 2320-21, 2321-22, 2322-23, 2323-24, 2324-25, 2325-26, 2326-27, 2327-28, 2328-29, 2329-30, 2330-31, 2331-32, 2332-33, 2333-34, 2334-35, 2335-36, 2336-37, 2337-38, 2338-39, 2339-40, 2340-41, 2341-42, 2342-43, 2343-44, 2344-45, 2345-46, 2346-47, 2347-48, 2348-49, 2349-50, 2350-51, 2351-52, 2352-53, 2353-54, 2354-55, 2355-56, 2356-57, 2357-58, 2358-59, 2359-60, 2360-61, 2361-62, 2362-63, 2363-64, 2364-65, 2365-



1. 1. N.

N. Morris, *Cons. Law*, 8p, 2000.

Position	Percentage	Polymerization	Other
1	100	100	0
2	100	100	0
3	100	100	0
4	100	100	0
5	100	100	0
6	100	100	0
7	100	100	0
8	100	100	0
9	100	100	0
10	100	100	0
11	100	100	0
12	100	100	0
13	100	100	0
14	100	100	0
15	100	100	0
16	100	100	0
17	100	100	0
18	100	100	0
19	100	100	0
20	100	100	0
21	100	100	0
22	100	100	0
23	100	100	0
24	100	100	0
25	100	100	0
26	100	100	0
27	100	100	0
28	100	100	0
29	100	100	0
30	100	100	0
31	100	100	0
32	100	100	0
33	100	100	0
34	100	100	0
35	100	100	0
36	100	100	0
37	100	100	0
38	100	100	0
39	100	100	0
40	100	100	0
41	100	100	0
42	100	100	0
43	100	100	0
44	100	100	0
45	100	100	0
46	100	100	0
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67	100	100	0
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79	100	100	0
80	100	100	0
81	100	100	0
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83	100	100	0
84	100	100	0
85	100	100	0
86	100	100	0
87	100	100	0
88	100	100	0
89	100	100	0
90	100	100	0
91	100	100	0
92	100	100	0
93	100	100	0
94	100	100	0
95	100	100	0
96	100	100	0
97	100	100	0
98	100	100	0
99	100	100	0
100	100	100	0

Fig. 1.N. - Solution of the system, 1, its spectrum. Fig. 1.N1. - Spectrum of field of view.

## ADDITIONAL GENERAL

[illegible][illegible]

0.0001 mm,  $T$ . *Stomach and Gizzard*



## ORDER XXV. DANÆACEÆ.—DANÆAWORTS.

*Agyratæ*, Swartz. *Synops.* (1806).—*Poropterides*, Willd. l. c. 66. (1810).—*Danæaceæ*, Agardh, l. c. 117. (1822).—*Marattiaceæ*, Kaulf. l. c. 31. (1824); *Bory*, l. c. (1824); *Mart. ic. pl. crypt.* 119. (1834); *Endl. gen.* xxxi.; *Link. filic. sp.* p. 31.

DIAGNOSIS.—*Filical Acrogens*, with ringless dorsal spore-cases, combined in masses, and splitting irregularly by a central cleft.

With all the habit of Dorsiferous Ferns, these plants are widely distinguished by the peculiar nature of their spore-cases, which are neither like those of Ferns nor

Adder's-tongues. To the latter they approach the nearest, but instead of being connected with, and perhaps fashioned out of, the margin of a contracted leaf, they appear sunk within, or more rarely seated upon, the back of the leaflets. The entire want of that elastic ring, which, in some state or other so strikingly characterises true ferns, gives them a far stronger title to be regarded as a distinct order, than the trifling differences which have in the eyes of some botanists elevated little groups of the latter to that dignity.

In addition to this, their spore-cases are always united more or less by their inner faces, as if in anticipation of the prevailing tendency among the carpels of flowering plants. For this reason they may be regarded as the highest form of the highest Alliance among Acrogens.

The few known species of the Order are all tropical in both hemispheres. Some form trees.

The bruised leaves of the fragrant *Angiopteris evecta*, an arborescent species, are said to be employed in the Sandwich Islands to perfume the cocoa-nut oil. The rhizome of *Marattia alata* is eaten by the Sandwich Islanders in time of scarcity, according to Mr. Hinds: this would appear to be the Nehai, and not the former plant.

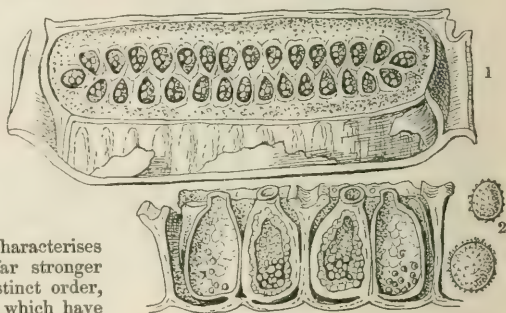


Fig. LXII.

## GENERA.

<i>Kaulfussia</i> , Blum.	<i>Clementea</i> , Cav.	<i>Eupodium</i> , J. Sm.	<i>Myriothecca</i> , Comm.
<i>Angiopteris</i> , Hoffman.	<i>Danæa</i> , Smith.	<i>Marattia</i> , Swartz.	<i>Celanthera</i> , Thoun.

NUMBERS. GEN. 5. Sp. 15. (J. Smith.)

POSITION.—Polypodiaceæ.—DANÆACEÆ.—Ophioglossaceæ.

Fig. LXII.—*Danæa alata*. 1. Collection of spore-cases; 2. sections of the same and spores, 2 of which are highly magnified.

## ADDITIONAL GENERA.

<i>Psilodochea</i> , Presl.	near <i>Angiopteris</i> .
<i>Discostegia</i> , Presl.	} to <i>Marattia</i> .
<i>Gymnothecca</i> , do.	
<i>Stribasia</i> , do.	
<i>Heterodanæa</i> , do.	
<i>Danæopsis</i> , do.	} to <i>Danæa</i> .



## CLASS III.—RHIZOGENS.

*Endogonum*, *Herm. Pl. Juss.*, (1828), *Endlicher's Method*, p. 19. (1822), *Edl. p. 106*, p. 100; *Juss.*, *Gen.* p. 72.

These are parasitical plants destitute of true leaves, in room of which they have cellular scales. Their stem is either an amorphous fungous mass, or a ramified mycelium, sometimes, perhaps always, appearing to be lost in the tissue of the plants on which it grows; and is very imperfectly supplied with spiral vessels which in some instances seem to be wholly deficient. No instance of green colour is known among them; but they are brown, yellow, or purple. They are furnished with true flowers, having genuine stamens and carpels, and surrounded by a trimerous or pentamerous calyx, or absolutely naked. Their ovules appear to be constructed upon the same plan as in other flowering plants. The true nature of their seeds is in most species quite unknown; by some they are described as breaking up into a mass of spores, by others as consisting of a cellular nucleus abounding in grumous corpuscles (*Edl.*), and in general they may be regarded as too small for exact observation; but it is certain that in some instances they have a minute undivided embryo enclosed in nucleiform granular albumen.

At this point of the Vegetable Kingdom we find a most curious anomaly, which, with many of the peculiarities of Endogens, seems to be an intermediate form of organisation between them and Thallogens. They have no relation to Acrogens, although they follow at this place, but they agree with Endogens in the presence of sexes, and sometimes in the ternary structure of their flower; they have, however, scarcely any spiral vessels, and their seeds appear, as far as they have been examined, either, as some say, to want the cotyledons and axis of other flowering plants, or to lose themselves in a mass of pulp, from which they are almost undistinguishable. In their amorphous succulent texture, in their colour, often in their putrid odour when decaying, in the formation of a mycelium or spawn, which is evident in *Helosis*, and is with good reason suspected to exist in others, and in their parasitical habits, these plants resemble Fungals, while in their flowers and sexes they accord with Arumworts, or similar Endogens.

Rhizogens all agree in being of a fungus-like consistence, and in their habits of living parasitically on the roots of other plants. They very generally stain water, or spirit, of a deep blood-red colour. Their forms are exceedingly diversified; some have the aspect of a Mushroom, or develop a head like that of a Bullrush (*Typha*): others push forth a cluster of flowers, or an elegant panicle; while some have their bloom in a head like that of some Cynaraceous plant. In *Helosis* and *Lungwortia* the rhizome, which is horizontal and branched, and which at intervals throws up perpendicular flowering stalks, is quite analogous to the spawn\* of

\* The existence of a mycelium has also been admitted by Dr. Brown. *Gen. Journ.* (1820). He suggests that in *Rhizoma* the earliest embryo of the stem, after being absorbed in the cellular tissue, consist in the formation of a cellular tissue extending towards the roots of the plant. He remarks that in *Phytolites* and *Cytisins*, where the plants are always apparently born from a common base or thallus, is pointed out the same similarity to the growth of the fungus, which is division, being produced generally, perhaps, in groups of 16, 32, 64, and 128, and of these groups, which are often very dense, not infrequently surrounding the roots of the plant. He adds, however, that this view is not sustained by subsequent observations, but that there are circumstances in both genera favourable to the hypothesis, especially in *Phytolites*.



Fungals. In *Cynomorium*, *Scybalium* and *Balanophora*, this part is wanting, and in its room the roots of those genera emit roundish deformed tubers collected in a circle upon the roots of other plants, and growing into them by some unknown process. Blume says, "that at the period of germination of *Balanophoreæ* there is produced from the roots of the Fig on which they grow an intermediate body, of a fleshy nature and intimately combined with its superficial woody layers, and that this intermediate body is penetrated by their spiral vessels, which render it woody." He moreover adds, that "several seeds of *Balanophoreæ* germinate on nearly the same points of the Fig-root; hence this woody body, or luxuriant product of the juices that are sucked out, has generally an irregular form, and the plants proceeding from such tubers grow out in different directions, much in the same manner as the tubers of a Potato generate their offsets: with this difference, however, that in a Potato the eyes of the plant are in the circumference, while in *Balanophora* they are placed in the centre, and on that account the intermediate body where the offsets break out, has necessarily a conical extension." Something of the same kind occurs in *Scybalium*, whose tubers are expanded in an irregular form about the root of some unknown tree, are fleshy, and composed even in the substance of the stalk of somewhat irregular cells and no spiral vessels. In the room of leaves these plants have scales, which differ from true leaves in the want of colour, a character common to all other plants parasitical on roots. A vertical stalk (stipes), sometimes terminated by a solitary head of flowers, sometimes bearing several heads variously arranged upon the stalk, is found in all the genera of *Balanophoraceæ*; which moreover agree in this that the flower-heads, which at first are sessile on the rhizome and concealed by many rows of imbricated scales, resemble the leafy rosette of a *Sempervivum* without colour, or rather the very small bud of a *Rafflesia*. The genuine species of *Helosia* show on their rhizome roundish conical buds seated on a very short stalk, or altogether sessile, enclosing the rudiments of the future head within a very thin involucre, as a fungus within the volva; this latter after a time splits into three or more segments, and emits the flower-head enlarged and furnished with a stalk, which is altogether naked except at the base, where it is surrounded by the scale-like segments of the withering involucre. This is the most simple form of involucre, which in the other genera becomes more and more complicated, and finally runs into numerous series of imbricated scales which clothe the stipes more or less completely. In those genera which grow upon the bark of the stems of trees, there are some diversities of structure in the organs of vegetation that are very remarkable. Blume tells us that *Rafflesia Patma* appears upon the creeping roots or stems of *Cissus scariosa* in the form of solitary or clustered hemispherical dilatations, which look like excrescences or expansions of the root. These excrescences are something of the nature of leaf-buds, consisting of layers of scales and a more solid centre. As the latter increase in size they burst through the wrapper by tearing it irregularly from the apex towards the base, and develop themselves in the form of numerous scales, at first flesh-coloured, then brownish, and finally deep purple, which surround the flowers. As soon as these parts are exposed, richly nourished as they are by the humid air that surrounds them, they grow with such rapidity that it is reported that *Rafflesia*, which, when full-blown, is a yard across, and when unexpanded, is as large as a middle-sized cabbage, only takes about three months for its complete formation. *Brugmansia* has a similar mode of development.

At one time it was believed that Rhizogens agreed with Fungals in the



total want of spiral vessels. That, however, was a mistake. Spiral vessels do not exist among them. Brown says that he has discovered them in *Rafflesia*, in which he originally failed to perceive them, and in several other cases. Martius also found them in *Langsdorffia*, in the form of bundles lying in the rhizome, stem and branches, and Mohl in similar parts of *Heliconia*, but in small quantity compared to the mass of the plants. Brown adds that "the vascular system of all these parasites is uniform and more simple than that of the far greater part of Phanogamous plants: that the spiral, or slight modifications of it, is the only form of vessel hitherto observed in any of them; and that the large tubes or vessels with frequent contractions corresponding imperfect diaphragms, and variously marked surface, which have received several names, as *vasa porosa*, *punctata*, *vasiform*, *collateral*, *tissue*, *dotted ducts*, &c., and which are so conspicuous in the majority of arborescent Phanogamous plants, have never been observed in any part strictly belonging to these parasites." (*Ann. Trans.* vol. xix. 231.) He however, does not attach systematical importance to this curious fact.

The flowers are in general formed upon some symmetrical plan, the proportions varying from genus to genus. But in a singular deformed genus called *Sarcophyte* the flowers are not reducible to symmetry, as far as has yet been observed. It has not, however, been examined in a philosophical manner.

The seeds of many Rhizogens have escaped the observation of those who have had the best opportunities of examining them. Even the seeds of the common *Cytinus Hypocistis* of the South of Europe are unknown. But if there has been a want of facts concerning this part of the structure there has been speculation in abundance for which the reader is referred to the last edition of this work. I can positively confirm the statement of the elder Richard (*Mém. Mus.* viii. t. xxi.), who gives to *Cynomorium cochinense* an embryo. I find in that plant that the seed consists of a mucilaginous mass filled with angular particles, which are doubtless loosely coloring cells. They contain starch in a very minutely globular state, but are chiefly composed of gum. On one side of this seed is a globular embryo, looking like a speck, but found, when properly examined, to be a globose mass of cells, destitute of starch, enclosed within the albumen, and apparently undivided on any part of its surface. It is, however, difficult to speak positively upon this point, on account of its smallness, and I am not sure that it is not very slightly 2-lobed. Francis Bauer too ascertained the ovules of *Rafflesia Arnoldi* to have the ordinary structure, a strong indication that the seeds would not be so anomalous as has been represented, and he found an undivided embryo in the seed of the same plant. (*Ann. Trans.* xix. t. xxv.), a circumstance confirmed by the observations of Brown. Ferdinand Bauer found in *Hydnora Africana* what seems to be a central ovule (*Ibid.* t. xxx.) of the same nature, and the researches of Weddell and Dr. Hooker leave no further room for doubting that all Rhizogens are truly embryonate.

Such being the supposed facts that have been ascertained with regard to these singular parasites, it only remains to notice some of the views entertained regarding them by systematic botanists. Dr. Robert Brown, who, aided by the microscopical drawings of the two Bauers, has had peculiar advantages for considering the question, appears to be opposed to the idea of regarding Rhizogens as a distinct class. He considers *Rafflesia* as being unquestionably allied to *Bursera*, and therefore as a firm *Rangon*. His objections to regarding Rhizogens as a distinct class are as follow:



He denies the absence of spiral vessels, which he himself and others once supposed to be a characteristic of some at least among them, and asserts that the vascular texture of Rhizogens is not essentially different from that of any perfectly developed Phænogamous plants. But, as was stated in the last edition of this work, the true question to be considered is, not as to the presence or absence of spiral vessels, but as to their abundance. In Exogens or Endogens *equally developed* they would be most copious, and would exist in all the foliaceous organs; and it is no argument against the importance of this circumstance, to say, that spiral vessels have no existence in certain Endogens, as Lemna, for instance; for in that and similar cases the small degree in which such plants are developed, may be considered to account for the absence of spiral vessels; just as in a common Exogen, the spiral system does not make its appearance until the general development of the individual has made some progress.

So, indeed, in Ferns and other Acrogens of high degree, we have no right to say that the vascular system is absent; on the contrary, in the centre of the stem of Clubmosses, and in the soft parts of that of Ferns, either spiral or scalariform vessels exist in abundance; but they do not make their appearance in the foliaceous organs as in more perfect plants.

Brown also attaches no importance to the supposed homogeneity of the embryo of Rhizogens, because the same structure, he says, exists in Orobanche and Orchids. But with regard to Orobanche, that plant has a slightly two-lobed embryo lying in a mass of albumen, so that I do not see how it can be brought into comparison with that of Rhizogens; and as to Orchids we have no right to say that their embryo is essentially different from that of common Endogens, except in its smallness.

The late Mr. Griffith adopted the views of Brown, and endeavoured, by new arguments, to show that Rhizogens cannot be regarded as a peculiar class in the Vegetable Kingdom. He asserted that these plants are not similar in their parasitism, and that in those he had examined there would appear to be two remarkably different types of development of the embryo. And he was persuaded that Rhizogens are an entirely artificial class, not even sanctioned by practical facility.—(*Proceedings of the Linnean Society, No. XXII.*, p. 220., where this author's views are given in detail.)

Arguments like those of both Brown and Griffith never appeared satisfactory to me. Most of the species brought together to constitute the class of Rhizogens seem to have little relation to other parts of the system. It is true that the genera differ much from each other in the details of their fructification; though not more than the genera of some other classes; but the character of the order does not depend upon the fructification. It depends upon the great peculiarity in the manner of growth, already pointed out; and the fructification is connected with questions of a subordinate degree. All the classes of plants depend equally upon such considerations; and, therefore, Rhizogens are logically a class. It was indeed singular that so acute a botanist as Griffith should not have perceived how much his position was weakened by comparisons like the following. He particularly directed attention to the resemblance between the pistil of Balanophorads and that of Mosses, or more especially to that of some evaginulate Liverworts, and to the effects produced by the action of the pollen on their styles. "Indeed," he observed, "in the development of the female organ, in the continuous surface of the style before fecundation, and in its obvious perforation after, Balanophora presents a direct affinity to a group of plants with which otherwise it has not a single analogy." In another genus, called Phæocordylis,



he found that the hairs in which the fruits are imbedded present a remarkable analogy with the paraphyses of *Preparophyllum* and certain *Noctua*, and also with bodies which he suspected to be the male organs of *Poria*. Surely this is a class of peculiarities which should indicate a group of lower rank than *Exogens* or *Endogens*.

Dr. Hooker, without adopting Griffith's views, is of opinion, after a more minute examination of *Balanophorads*, that that order at least has no claim to be separated from *Exogens*, but that it has a plain affinity to *Onogonads*. In order that the arguments adduced in support of this view of a very difficult question may be exactly stated, I have requested my acute friend, who has had ample opportunities of examining *Balanophorads*, to furnish me with his own statement; and the reader will find it in the succeeding page.

There is an account of *Rhizogens* by Endlicher in his *Methodenata*, which contains a summary of all that was in 1832 known concerning them. For further information the reader is referred to Blume's *Flora Java*; Martius' *Nora Genera*, &c., vol. 3; Brown's *Observations on Raffines*, in the 13th and 19th volumes of the *Linnean Society's Transactions*; Griffith, in the *Proceedings* of the same learned body, the various works quoted at the head of the following natural orders, and in a note by Dr. Hooker upon *Cynomorium* in *Webb's Histoire Naturelle des Comarices* iii. 431.



## ORDER XXVI.—BALANOPHORACEÆ.—CYNOMORIUMS.

Balanophorea, *Rich. in Mem. Mus.* 8, 429. (1822); *Endlicher Metemata*, p. 10. (1832); *gen.* xxxix. *Meisner*, p. 366; *Jenghans in noc. act.* xviii. suppl.; *Griffith, Proceedings Linn. Soc.* No. xxii.

DIAGNOSIS.—*Stems amorphous, fungoid; peduncles scaly; flowers in spikes; ovules solitary, pendulous; fruit one-seeded.*

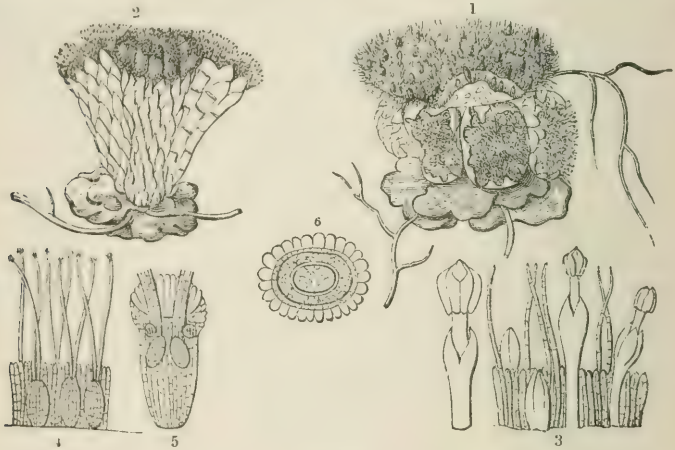


Fig. LXIII.

"Leafless, brown, red, white, or yellow (never green) root-parasites, with underground fleshy horizontal branched rhizomes, or more generally amorphous tubers, from which spring erect simple (rarely branched) peduncles, that are naked, or covered with scattered or imbricating scales, rarely combined into an involucre. Flowers red, yellow, or white, unisexual (rarely bisexual), monœcious or dioœcious, collected into dense, spherical or cylindrical, entire, lobed, or branched heads, often mixed with simple articulated filiform or club-shaped filaments. Bracts very variable, or absent; sometimes, when the heads are lobed, large, peltate, and imbricated, each subtending and often covering a lobe (branch) of the head; at other times the bracts are scattered promiscuously amongst the flowers; sometimes they are peltate, and connected by their contiguous edges into an areolate indusium, that falls away piecemeal as the head enlarges; at others the flowers are arranged on their stipes. Male flowers conspicuous, usually white, pedicelled, exserted beyond the filaments and female flowers, generally at the base of hermaphrodite heads, or scattered irregularly amongst female flowers, rarely wholly naked, then consisting of anthers crowded on a branched spike. Perianth tubular or funnel-shaped, entire or split, or more frequently 3-5-lobed, with valvate aestivation; lobes patent, or reflexed, fleshy, white, or highly-coloured. Stamens usually 3-5, with both filaments and anthers more or less connate or free, the latter frequently forming a lobed 6-12-celled mass, bursting outwards, or rarely inwards. (Stamen solitary, epigynous, and introrse, in bisexual flowers of *Cynomorium*. Stamens 3,

nearly free and extrorse in *Langsdorffia*; 3 and free in *Sarcophyte*, where each filament bears a capitate anther, that breaks up into a many-celled mass. Anthers

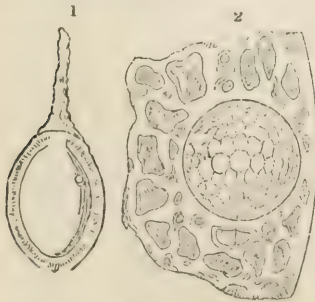


Fig. LXIV.

nearly free and extrorse in *Langsdorffia*; 3 and free in *Sarcophyte*, where each filament bears a capitate anther, that breaks up into a many-celled mass. Anthers

Fig. LXIII. *Scybalium fungiforme*. 1. A male plant; 2. a female; 3. male flowers with hairs between them; 4. females; 5, a vertical section of a female, with the two pendulous ovules; 6. a section across a ripe fruit.

Fig. LXIV. *Cynomorium coccineum*. 1. A section of the ripe fruit, showing the embryo on the right of the albumen; 2. a portion of the nucleus very highly magnified, showing the embryo and the angular cells among which it lies. N.B. These cells are separated by the pressure of a compressorium.



numerous and anfractuous in Polyplethra; pollen *oblong*, yellow. Liliaceous. Female flowers very infinite, densely crowded usually in stalks sometimes round the base of a club-shaped pedicel (Balan-plum), shorter than the stamens amongst which they often nestle, and beyond which the style protrudes, generally consisting of a compressed ovary, with 1-2 styles. Perianth seldom apparent, closely investing the ovary, and not distinguishable from it. (Both 2-lobed, or rarely 3-lobed (Cynomorium), there are 6 irregularly inserted valvate pieces of the perianth. Ovary 1-celled (2-celled according to Endlicher in Scybalium). Ovule a solitary naked pendulous nucleus; position of apex unknown. Style 1 or 2 lobed, naked, with a simple papillose stigma. (Style flattened in Cynomorium, having two parallel filaments, and two papillose stigmatic points. In Sarcophyte, the female flower coalesce into fleshy capitula, which are sessile on a branched axis, and have sessile stigmata). Fruit a small compressed nut, epicarp rather fleshy; endocarp crustaceous. Seed solitary, pendulous, filling the cavity of the pericarp. Albumen of large, hard, densely packed grains, adherent to the delicate membrane that surrounds them. Embryo lateral in Cynomorium and Chrysea; spherical, unilobed, and nut in the former; harder, compressed, and lobed in the latter.

"A very remarkable natural order, displaying much variety in habit and structure of the floral organs, but agreeing in all essential characters, especially in those of reproduction. They have been likened to Fungi in appearance and mode of growth by some, but others fail to recognize any such similarity. They differ wholly from that natural order in consistence, anatomy, structure, slow mode of growth, and in having conspicuous brightly coloured male flowers.

"The earliest stage at which I have examined Balanophora, and some allied American plants, presents a minute amorphous cellular mass, nesting in regions of the bark of the root of the plant, which is henceforward the stock. Vascular tissue forms in the axis of this mass, which swells, and displacing more bark, enlarges to a tuberous rhizome, that in most cases finally envelopes the root, to which it is attached on one side only. In Helosis and Lausdordia, a branched rhizome is formed underground. This rhizome has a diastyledomous arrangement of its vascular plates, and sometimes gives off rootlets, which, when they come in contact with other root-fibres of the stock, induce a specific action on them, terminating in destruction of the bark, and a further attachment of the parasite. In no case has the germination of the embryo been observed, but the subsequent stages of growth so entirely resemble those of Lorantheaceæ, that there appears no reason to expect any anomaly in the first stages.

"The rhizome, when tuberous, is generally covered with large lenticels (l), consisting of cellular, often cruciform pustules, uncovered by the cuticle. In these tubers the arrangement of the vascular bundles into plates is also exogenous, resembling closely in anatomical details that which prevails in some species of Lorantheaceæ. Bundles of vascular tissue run from the tuber (or rhizome) into the peduncle, where they are often symmetrically arranged, and supply the scales, the bractæ, and the lobes or branches of the inflorescence. The cellular tissue is composed of large multangular cells, full of resinous matter and some starch grains (g); the vascular of slender tubes, large, lured, spirally marked, seldom unrollate tubes, of bathytracheæ, and of cylindrical and hexagonal, simple and septe tubes; also of epans thick sclerous tubes and cells, with perforated walls. There are no true spiral vessels, and the vascular tissue is always in contact with the wood of the stock, which latter sometimes ramifies in the tuber. This contact is sometimes so intimate, that it is impossible to separate the vascular bundles of the parasite from those of the stock; and after long maceration, the latter may hence be traced apparently running continuously up the peduncle, and into the head of flowers. The peduncle arises from one part of the tuber or rhizome: in its youngest state it is generally covered by adnate scales; vascular bundles form independently in its suberous, and descend to join those of the rhizome. The cuticle of the peduncle and scales has no vascular, whose functions are probably performed by the lenticels of the rhizome. The flowers that nestle amongst the female flowers of the American genera, and in Phacotylis, appear to be abortive female flowers in most cases, but may, in others, and there, be also in part reduced, deformed, or displaced segments of a pistillate bract, as Cynomorium suggests. They have been compared with the paraphyses of mosses,\* with which they have no further affinity or analogy than that both are cellulosic organs. The ovaria have also been likened to the pistillides of Mosses and Hepatics, to which they bear no relation in structure, origin, or function. In the youngest state, the female flowers of some American species are 2- and even 3-lobed, with many styles.

\* GRAY, *Ann. Sci. France*, &c., p. 31, pl. 3, fig. 10.



"In endeavouring to determine the affinities of Balanophoreæ, I have confined my attention to the organs of reproduction, which, whether male or female, are perfect, and typical of Phænogamic plants in all respects, though reduced in number and proportion of parts; at the same time rejecting the more prominent, but comparatively unimportant characters of growth and appearance, colour, parasitism, and the inability of most observers to find embryos in some, such being conspicuous in others. The exogenous arrangement of the vascular bundles of the rhizomes, lobed embryo of Corynea, and decidedly dicotyledonous one of Mystropetalum are the most important positive characters hitherto observed, by which to determine the division of the vegetable kingdom to which Balanophoreæ should be referred, which is hence Dicotyledones. The one-celled inferior ovary, with often two styles, adherent two-lipped or truncate perianth, unisexual flowers, epigynous stamen when the flowers are bisexual, solitary pendulous ovule, and the structure of the albumen and embryo wherever these are made out, are all typical of plants referred to or closely related to Haloragaceæ, an order in which there is a great tendency to imperfection of the floral organs. The female inflorescence of Lepidophyton (n. g. ined.) differs in no respects, except in having larger bractææ, from that of Gunnera scabra; whilst the dense albumen of all Balanophoreæ, composed of large grains covered with a membranous testa, that adheres to the walls of the pericarp, and the minute embryo, also characterize the seed of all species of Gunnera. The bisexual monandrous flowers of Cynomorium in many respects closely resemble those of Hippuris, and its perianth is more highly developed, though more irregular in insertion. Equally strong and decided points of affinity may be found in the male flowers, both in the development and suppression of their parts, but such details are unsuited to these pages.

"Balanophoreæ are found on the roots of various Dicotyledonous plants (Vines, Maples, Oaks, Araliaceæ, &c. &c.) and abound in the mountains of tropical countries, especially the Andes of Peru and Colombia, the Himalaya (where they ascend to 11,000 feet in Lat. 28° N.) and Khasia Mountains of India. In the old world one (Cynomorium) is found in Malta, N. Africa, the Levant, and Canaries; another on the west coast of Africa; Sarcophyte in South Africa. Eight or ten species inhabit the Indian Continent, and others its islands, the north coast of Australia and Polynesia. As many are found in Mexico, Central and South America, and Jamaica (where Phyllocoryne, n. g. ined., is called Jim Crow's Nose). A few are Brazilian, and Mr. Miers informs us that one grows on the Pampas.

"The direct uses are few. They seem, as far as anything is known of them, to be styptics. The Cynomorium coccineum, or Fungus melitensis of the apothecaries, long had a great reputation in that way; and various kinds of Helosis have had a similar character. Sarcophyte, a Cape plant, is said to have an atrocious odour. Pöppig says, that Ombrophytum, which in Peru springs up suddenly after rain, in the manner of the toadstool, is called Mays del Monte, in consequence of its resemblance to a kind of Maize, and is quite insipid, on which account it is cooked and eaten like Fungi. This, if true, presents a remarkable contrast with the Balanophoras of India, whose spikes are very slowly developed, and decay after ripening their seeds very gradually indeed. Lepidophytum is also eaten in Bolivia. Cups, used throughout Tibet, are turned from knots produced on the roots of maples by the Himalayan species."

#### GENERA.

##### Tribe—Balanophoridae.

*Balanophora*, Forst.  
*Cinnyphala*, Endl.  
*Polysiphonia*, Griff.  
*Sarcocordylis*, Wall.

##### Tribe—Cynomoridae.

*Cynomorium*, Michx.

##### Tribe—Sarcophytidae.

*Sarcophyte*, Spence.

*Ichthyosma*, Schlecht.

##### Tribe—Lophophytidae.

*Lophophytum*, Schott.

*Archimacha*, Leand.

*Ombrophytum*, Papp. & Endl.

*Lepidophytum*, Hook. fil.

##### Tribe—Helosidae.

*Helosis*, Rich.

*Caldasia*, Mut.

*Lathraephila*, Leand.

*Langsdorffia*, Mart.

*Scybalium*, Schott.

*Phæocordylis*, Griff.

? *Rhopalocnemis*, Jungh.

*Corynea*, Hook. fil.

*Phyllocoryne*, Hook. fil.

?

*Thomningia*, Schum.

*Hæmatostrobis*, Endl.

J. D. HOOKER.



## ORDER XXVII. CYTINACEÆ. — CISTUS-RAPIES.

*Cytinus*, *Alph. Brongn. in Ann. des Sc. Nat.* 1. 20. (1821). *Endlicher Monocotyl.* 1. 13. *Gen. et Maxim.* p. 267. *R. Brown in Linn. Trans.* vol. 1. 1. 1828. *Ann. Bot.* p. 260. (1828). — *Art. Bot.* 1. 5. *Cytinus*, *Jack. Hanc.* 1. 1828. 1. 3. — *Hydnora*, *R. Br. Linn. Trans.* 16. (1844).

**DIAGNOSIS.** — *Flowers in spikes at the end of a leafy stem, with a 3-lobed calyx, and long opening by slits, and innumerable scales growing over parietal placentæ.*

Flowers  $\frac{1}{2}$ , or  $\frac{3}{4}$ , solitary and stemless, or clustered at the top of a stalk covered with imbricated scales, the males uppermost, the females lowermost, in the axil of a bract, and supported on each side by a bractlet. Perianth tubular campanulate, with a spreading 3-lobed limb, the segments imbricated, the exterior alternating with the bractlets or induplicate and valvate. Anthers sessile, 2-celled; their cells distinct, opening longitudinally; four dissepiment-like membranes in *Cytinus* alternate with the segments of the perianth, and join its tube with the column. Perianth as in the males, but epigynous. Ovary inferior, 1-celled, with vertical or parietal placentæ, covered by innumerable ovules; style cylindrical, joined to the tube of the perianth by septiform processes, with a thick stigma, or free, and consisting of several styles, each having a free stigmatic apex. Fruit berried, leathery, one-celled, with innumerable seeds buried in pulp, and having a hard leathery skin firmly attached to the nucleus. Seed in *Hydnora*, with a small undivided embryo in the centre of cartilaginous albumen, and in *Cytinus* exalbuminous according to Brown.

In these we have a near approach to the common condition of *Endogens*, both in structure and habit. If we compare *Cytinus* with some *Bromelworts*. But the appearance of *Hydnora* is so peculiar that we know nothing to contrast it with, except some such Fungus as a *Gaster*, like which it grows half-buried in the soil. Its innumerable seeds distinguish it from *Rafflesias*, as well as its caducous habit and slit anthers.

The history of this extraordinary plant has been fully given by Ferdinand Bauer and Dr. Brown, in the 19th vol. of the *Linnæan Transactions*, from which place the accompanying cuts are taken. The genus is regarded by Brown as the type of a peculiar Order; and perhaps with justice. But for reasons elsewhere given, I dissent to the formation of all Orders that depend upon a single genus.

*Cytinus* is parasitical on the roots of *Cistus* in the South of Europe; the rest are from the Cape of Good Hope, where *Hydnora* is parasitical on the roots of succulent *Euphorbias*, and of *Cotyledon orbiculatum*.

*Hydnora Africana* (*Jackals Kost* or *Kauimp*), smells like decaying rust-bark, or some fungus (*Hæmorrhage*); when roasted it is eaten by the African savages. *Cytinus Hydnoræ* (*Hydnora* Diosc.) contains gallic acid, and according to Pelletier, has the property of precipitating gelatine without containing tannin; its extract is still official in the South of Europe, under the name of *Succus Hypocistidis*; it is thickish, subacrid, astringent, and is employed in hæmorrhages and dysentery.

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Fig. LXV. *Cytinus Hypocistidis*. 1. A flower. 2. A head of *Hydnora*. 3. A transverse section of the ovary.

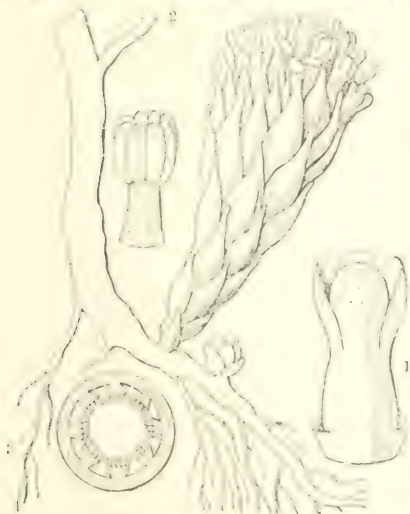


FIG. LXV.



## GENERA.

*Cytinus*, L.  
*Hypocistis*, Tourn.  
*Hydnora*, Thunb.

*Aphyteia*, L.  
*Hypolepis*, Pers.  
*Phelypea*, Thunb.

*Hyobanche*, Sparrm.  
*Thyrsine*, Gled.  
 ? *Thismia*, Griff.  
*Sarcosiphon*, Blume.

NUMBERS. GEN. 4. Sp. 7.

*Fungales.*

POSITION.—*Rafflesiaceæ*.—*CYTINACEÆ*.—*Balanophoraceæ*.  
*Bromeliaceæ*?

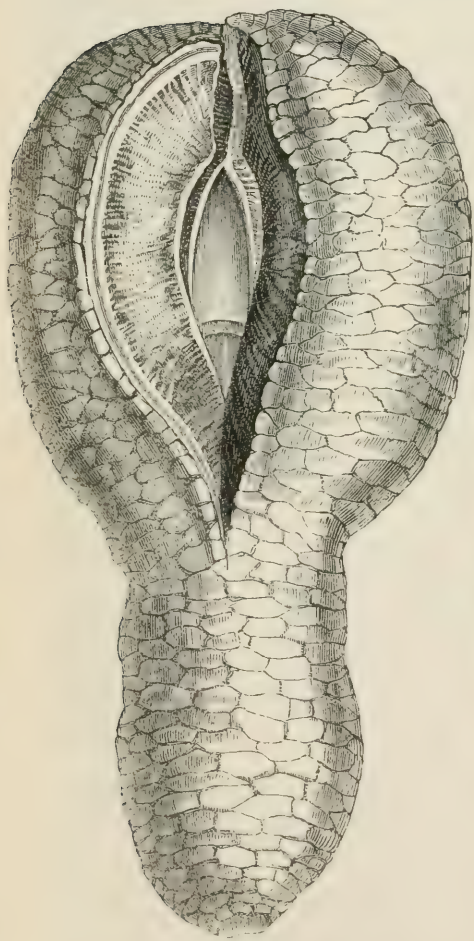


Fig. LXVI.

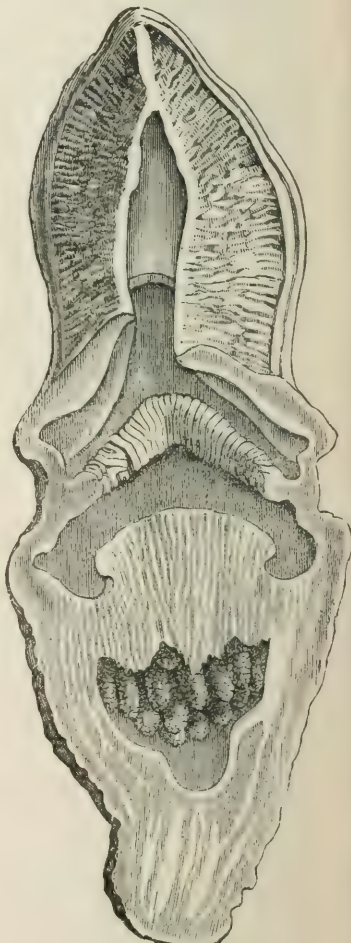


Fig. LXVII.

Fig. LXVI. A plant of *Hydnora Africana*. Fig. LXVII.—A longitudinal section of it. *Ferd. Bauer.*

Blume suggests that *Thismia* (his genus *Sarcosiphon*) may be the type of a new order of Rhizanth. He describes it as a leafless parasite, growing on the roots of trees, resembling in appearance an Angiogastrous Fungus, and smelling like stinking fish. Miers refers this genus to Triurids (see p. 172).



## ORDER XXVIII. RAFFLESIACEÆ.—RAFFLESIADS.

Rafflesiaceæ, *Endlicher Metemata*, p. 14. (1832); *Gen. xli. Meisner*, p. 367; *R. Brown in Linn. Trans.* 13. 241.

**DIAGNOSIS.**—*Stemless and stalkless; flowers 5-parted, sessile on the branches of the solitary, with anthers opening by pores, and innumerable ovules growing over parietal placenta.*

Stemless plants, consisting merely of flowers growing immediately from the surface of branches, and immersed among scales; flowers hermaphrodite, or dioecious. Perianth superior, globose or campanulate; the limb 5-parted, with the segments imbricated or doubled inwards in aestivation; the throat surrounded by calli, which are either distinct or run together into an entire ring. Column (synema) hypocrateriform or sub-globose, adhering to the tube of the perianth; anthers numerous, distinct, or somewhat connate, adhering by the base, in one row; 2-celled, with the cells opposite, and each opening by a vertical aperture, or concentrically many-celled with a common pore. Ovary inferior, 1-celled, with many-seeded parietal placenta; styles conical, equal in number to the placenta, run together within the column, but projecting beyond it, and then distinct. Fruit, an indehiscent pericarp, with an infinite multitude of seeds. [Embryo undivided, with or without albumen.—*R. Brown.*]

These extraordinary plants have no stems whatever, but consist of flowers only, supported by scales in room of leaves. Among them is the very remarkable species described by Brown in the 13th vol. of the *Linnean Society's Transactions*, under the name of *Rafflesia*, to which those may be referred who are desirous either of knowing what is the structure of one of the most anomalous of vegetables, or of finding a model of botanical investigation and sagacity, or of consulting one of the most beautiful specimens of botanical analysis which Francis Bauer ever made. They differ from the *Cistaceæ* in having no proper stem, in their anthers being porous, and in their flower, which constitutes the whole plant, being divided by 5, like *Exogens*, instead of 2 or 3, like *Endogens*. An affinity has been suggested with Birthworts, to which this Order seems to have no immediate relationship.

Natives of the East Indies, on the stems of *Cissis*; or of South America, on the branches of leguminous plants.

*Rafflesia Patma* is employed in Java as a powerful styptic, in relaxation or debility of the urino-genital apparatus, and *Brugmansia* seems to possess similar qualities.

## GENERA.

* <i>RAFFLESIA</i> , <i>R. Br.</i>	<i>BRUGMANSIA</i> , <i>Wurm.</i>	* <i>APODANTIA</i> , <i>R. Br.</i>	<i>Phyllis</i> , <i>Griseb.</i>
<i>Rafflesia</i> , <i>R. Br.</i>	<i>Zippelia</i> , <i>Rehb.</i>	<i>Apodanthes</i> , <i>P. J.</i>	<i>Fouquieria</i> , <i>Bert.</i>
<i>Sapria</i> , <i>Griffith.</i>	<i>Mycatanthe</i> , <i>Rehb.</i>		

NUMBERS. GEN. 5. Sp. 16.

*Aspidocaulon*, *Rehb.*

POSTERIX. — *Balanophoraceæ* — *RAFFLESIACEÆ*. — *Cytinaceæ*.

FIG. LXXIII. — *Phyllostylis Bortonii*. 1. A vertical section of a flower; 2. a young flower bursting through the bark; 3. a head of stamens.



MYSTROPETALINÆ.—*J. D. Hooker.*

"A genus of monœcious root-parasites. Stem sheathing, covered with imbricating scales, terminated by a dense-flowered head. Flowers with three villous bractæ. Males on upper part of the spike; of three valvate sepals connate at the base. Stamens two, inserted on the petals and opposite them; anthers posticous; pollen angular. Female flower; perianth superior, tubular, 3-toothed, minute; ovary 1-celled, with one pendulous ovule, seated on a disc; style filiform; stigma 3-lobed. Fruit a spherical achene, 1-celled, with one albuminous seed filling the cavity; structure as in Balanophoreæ.

"*Mystropetalum* is well described by Griffith (note in *Linnean Transactions*, vol. xix. p. 336), who, however, strangely overlooked the pendulous ovule and the embryo, which, though small, is very evident, broad, has a short blunt radicle pointing upwards, and two short broad cotyledons, just as in *Gunnera*. The testa is a very thin membrane. Albumen of very large hard grains. The genus appears near *Loranthaceæ* in many respects, and betrays some affinity with *Compositæ*. It is another, in short, of the many incomplete epigynous orders, such as *Loranthaceæ*, *Santalaceæ*, *Corneæ*, *Araliaceæ*, *Balanophoreæ*, *Gunneraceæ*, *Haloragææ*, &c. &c., which are all obscure, often imperfect as to floral envelopes and ovules, and of very difficult and uncertain affinity."

## ONLY GENUS.

*Mystropetalon*, *Harvey*.

Two species only are known, both natives of S. Africa.

J. D. HOOKER.



## CLASS IV.—ENDOGENS.

Monocotyledons, *Juss. Gen.* 21. *Fl. Sp.*, *Def. Med.* *Juss.* 1. 478. (1796). Endogens, *Andr. Acad. Sci. Paris*. Monocotyledones, *Endogones*, *DC. Tableau*, 207. 1813. *Marsson.*, *in Ann. Cryptog. Botanique et Géologie*, *Paris*, 1821. — *Asch. & Speg.*, *Fl. Atl. Germ.* p. 76. — *Telegraphus*, *in Bot. Beech.*

Having now passed in review the absolutely sexless plants, called Thallo-gens, and all that class which, under the title of Acrogens, comprehends a numerous race among whom the existence of a double sex is conjectured to exist, and having, moreover, disposed of the curious Rhizogens, which, to a fungal mode of growth join a complete sexual apparatus, we pass to Endogens, or Monocotyledons.

Here we find a vast multitude of species, with extremely diversified habits, among whom occurs every attribute supposed to be connected with the most perfect structure. Leaves and stems are distinctly separated; spiral vessels, breathing-pores, and sexes, are in a condition that admits of no further complication; and we find in the great majority everything which constitutes an elaborate arrangement of parts as we have any knowledge of in the vegetable kingdom.

This great class bears the name of Endogens, in consequence of its new woody matter being constantly developed in the first instance towards the interior of the trunk, only curving outwards in its course downwards. That palm-trees grow in this way was known so long since as the time of Theophrastus, who distinctly speaks of the differences between endogenous and exogenous wood.\* But that this peculiarity is also extended to a considerable part of the vegetable kingdom is a modern fact, the discovery of which we owe to the French naturalists Daubenton and Desfontaines. The path being thus opened, the inquiry has subsequently, and more particularly of late years, been much extended, and the result is the conviction that all those numerous races to which Jussieu applied the name of Monocotyledonous, agree essentially in this manner of growth. We may take the palm-tree as typical of the endogenous structure. In the beginning the embryo of a palm consists of a cellular mass of a cylindrical form, very small and not at all divided. As soon as germination commences a certain number of cords of ligneous fibre begin to appear in the radicle, deriving their origin from the plumule. Shortly afterwards, as soon as the rudimentary leaves of the plumule begin to lengthen, spiral and dotted vessels appear in the tissue in connection with the ligneous cords; the latter increase in quantity as the plant advances in growth, shooting through the cellular tissue, and keeping parallel with the outside of the root. At the same time the cellular tissue increases in diameter to make room for the ligneous cords (or woody bundles, as they are also called). At last a young leaf is developed with a considerable number of such cords in connection with its base, and, as its base passes all round the plumule, these cords are consequently connected equally with the centre which that base surrounds. Within this second leaf gradually unfolds, the cellular tissue increasing horizontally at the same time; the ligneous cords, however, soon cease to maintain anything like a parallel

\* *Fl. Hist. plant. collect. p. 181. and p. 182. p. 183. p. 184. p. 185. p. 186. p. 187. p. 188. p. 189. p. 190. p. 191. p. 192. p. 193. p. 194. p. 195. p. 196. p. 197. p. 198. p. 199. p. 200. p. 201. p. 202. p. 203. p. 204. p. 205. p. 206. p. 207. p. 208. p. 209. p. 210. p. 211. p. 212. p. 213. p. 214. p. 215. p. 216. p. 217. p. 218. p. 219. p. 220. p. 221. p. 222. p. 223. p. 224. p. 225. p. 226. p. 227. p. 228. p. 229. p. 230. p. 231. p. 232. p. 233. p. 234. p. 235. p. 236. p. 237. p. 238. p. 239. p. 240. p. 241. p. 242. p. 243. p. 244. p. 245. p. 246. p. 247. p. 248. p. 249. p. 250. p. 251. p. 252. p. 253. p. 254. p. 255. p. 256. p. 257. p. 258. p. 259. p. 260. p. 261. p. 262. p. 263. p. 264. p. 265. p. 266. p. 267. p. 268. p. 269. p. 270. p. 271. p. 272. p. 273. p. 274. p. 275. p. 276. p. 277. p. 278. p. 279. p. 280. p. 281. p. 282. p. 283. p. 284. p. 285. p. 286. p. 287. p. 288. p. 289. p. 290. p. 291. p. 292. p. 293. p. 294. p. 295. p. 296. p. 297. p. 298. p. 299. p. 300. p. 301. p. 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direction, but form arcs whose extremities pass upwards and downwards, losing their extremities in the leaf on the one hand, and on the other in the roots, or in the cellular integument on the outside of the first circle of cords ; at the same time the second leaf pushes the first leaf a little from the centre towards the circumference of the cone of growth. In this manner leaf after leaf is developed, the horizontal cellular system enlarging all the time, and every successive leaf, as it forms at the growing point, emitting more woody bundles curving downwards and outwards, and consequently intersecting the older arcs at some place or other ; the result of which is that the first formed leaf will have the upper end of the arcs which belong to it longest and much stretched outwardly, while the youngest will have the arcs the straightest ; and the appearance produced in the stem will be that of a confused entanglement of woody bundles in the midst of a quantity of cellular tissue. As the stem extends its cellular tissue longitudinally while this is going on, the woody arcs are consequently in proportion long, and in fact usually appear to the eye as if almost parallel, excepting here and there, where two arcs intersect each other. As in all cases the greater number of arcs curve outwards as they descend, and eventually break up their ends into a multitude of fine divisions next the circumference where they assist in forming a cortical integument, it will follow that the greater part of the woody matter of the stem will be collected near the circumference, while the centre, which is comparatively open, will consist chiefly of cellular tissue ; and when, as in many palms, the stem has a limited circumference, beyond which it is its specific nature not to distend, the density of the circumference must, it is obvious, be proportionably augmented. It is however a mistake to suppose that the great hardness of the circumference of old palm wood is owing merely to the presence of augmenting matter upon a fixed circumference ; this will account but little for the phenomenon. We find that the woody bundles next the circumference are larger and harder than they originally were, and consequently we must suppose that they have the power of

increasing their own diameter subsequent to their first formation, and that they also act as reservoirs of secretions of a hard and solid nature, after the manner of the heartwood of exogens.

When the growth of the stem of an endogen goes on in this regular manner, with no power of extending horizontally beyond a specifically limited diameter, a trunk is formed, the sections of which present the appearances shown in the accompanying cut. There is a number of curved spots crowded together in a confused way, most thick and numerous at the circumference, comparatively small and thinly placed at the centre ; and the only regular structure that is observable with the naked eye is that the curves always present their convexity to the

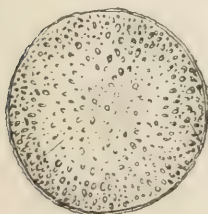


Fig. LXIX.



Fig. LXX.



circumferenced. When there is no limited circumference assigned by nature to an Endogen, then the curved spots, which are sections of the woody arcs, are much more equally arranged, and are less crowded at the circumference. Never is there any distinct column of pith, or medullary rays, or columnar arrangement of the woody arcs; nor does the cortical integument of the surface of endogenous stems assume the character of bark, separating from the wood below it; on the contrary, as the cortical integument consists very much of the finely divided extremities of the woody arcs, they necessarily hold it fast to the wood, of which they are themselves prolongations, and the cortical integument can only be stripped off by tearing it away from the whole surface of the wood, from which it does not separate without leaving myriads of little broken threads behind.

This is the apparent and general structure of the most perfect among Endogens. It is of course modified exceedingly according to the nature of particular individuals, and may even be reduced to nullity, as is the case in *Lemna*, *Tillandsia usneoides*, *Naiads*, and similar plants.

Schleiden, who treats this subject in a merely anatomical manner, thus describes the peculiarities of Endogens or Monocotyledons, and the manner in which they differ from Exogens or Dicotyledons.

In all plants, he says, the woody bundles, whose development always proceeds from the interior to the exterior, are either limited or unlimited in their growth. Commonly every woody bundle consists of three different physiological parts; firstly, of a tissue of extreme delicacy, capable of rapid development, in which new cells are continually generated and deposited in various ways, in two different directions, viz. next the circumference, in the shape of a peculiar kind of lengthened cellular tissue with very thick walls, the liber; and next the centre, in the form of annular, spiral, reticulate, and porous vessels: secondly, of woody cells, which are either uniform in appearance, or different, and form the wood, properly so called. Up to a certain period the development of the vascular system in Monocotyledons and Dicotyledons proceeds upon the same plan; but in Monocotyledons (Endogens) the active, thin, solid, delicate cellular tissue, suddenly changes; the partitions of its cells become thicker; their generating power ceases; and when all the surrounding cells are fully developed, they assume a peculiar form, ceasing to convey gum, mucilage, and other kinds of thick formative sap.

From this cause all further development of vascular bundles is rendered impossible, and therefore Schleiden calls the woody bundles of such plants "limited." In Dicotyledons (Exogens), on the contrary, this tissue retains, during the whole lifetime of the plant, its vital power of formation: continues to develop new cells; and so increases the mass, ceaselessly augmenting both the exterior (liber), and the interior faces (wood), for which reason Schleiden calls such woody bundles "unlimited." This, he continues, happens according to the climate and nature of the plant: either pretty continuously, as in *Cactaceæ*; or by abrupt periodical advances and cessations, as occurs in forest trees of Europe. In the latter, the stem forms an uninterrupted tissue, from the pith to the bark, during every period of life, and the bark is never organically separate from the stem: what is considered their natural separation in the spring, is only a rent produced by tearing the delicate tissue already spoken of, which is present, even during winter, and constitutes the foundation of new annual zones, although compressed, and filled with gum, starch, and other secretions. In the spring, being expanded and swollen by the new current of sap, it is deprived of its contents by their solution.



This difference between limited and unlimited woody bundles affords, in Schleiden's opinion, the only universal distinction between Endogens and Exogens. In the annual Exogens the unlimited woody bundle, checked in its further development by the death of the plant, has, it is true, in so far some similarity to the limited one of Endogens; yet, sufficient research shows the difference distinctly, for the formative layer in the former constantly retains to the last moment its generating power. (*See Annals of Natural History*, iv. 236.)

The distinction between Endogens and Exogens, whether it be as we have first described it, or such as Schleiden states, is so obvious and universally recognised, that one would have thought them beyond the reach of controversy. Nevertheless, M. de Mirbel has very recently (*Comptes Rendus*, Oct. 1844, p. 699) asserted, that, according to his theoretical views of their structure, a great number of Monocotyledons are Exogens, more especially Dracæna, Phoenix, Chamærops, and Bromelia. Meneghini, moreover, long since pointed out the fact that *Yucca gloriosa* arranges its woody bundles in concentric circles, (*Ricerche sulla Struttura del Caule nelle Piante Monocotiledoni*, Padova 1836) and the same tendency is discoverable in some other Endogens allied to *Yucca*. But the mere gathering together the woody bundles into imperfect rings, does not in any degree invalidate the distinction between Endogens and Exogens, because their whole manner of growth is different. The fibrovascular tissue which forms the wood of *Yucca gloriosa* itself, is in fact present in the form of arcs, just as much as in a Palm-tree.

In many of the larger kinds of Endogens the stem increases principally by the development of a single terminal bud, a circumstance unknown in Exogens, properly so called. In many however, as all grasses, the ordinary growth takes place by the full development of axillary buds in abundance.

In general there is so great a uniformity in the structure of an endogenous stem, that the common cane or asparagus illustrates its peculiarities sufficiently. There are, however, anomalous states that require explanation.

Grasses are endogens with hollow stems strengthened by transverse plates at the nodes. This is seen in the bamboo, whose joints are used as cases to hold rolls, or in any of our indigenous species. In this case the deviation from habitual structure is owing to the circumference growing faster than the centre, the consequence of which is the tearing the latter into a fistular passage, except at the nodes, where the arcs of ligneous tissue, connected with the leaves, cross over from one side of the stem to the other, and by their entanglement and extensibility form a solid and impenetrable diaphragm. That this is so is proved by the fact, that the stems of all grasses are solid, or nearly so, as long as they grow slowly; and that it is when the rapidity of their development is much accelerated that they assume their habitual fistular character. In the sugar-cane grass the hollowness of the stem is indeed unknown. Independently of that circumstance, their organisation is sufficiently normal.

*Xanthorrhæa hastilis* has been shown by De Candolle to have an anomalous aspect. When cut through transversely, the section exhibits an appearance of medullary rays proceeding with considerable regularity from near the centre to the very circumference. (*Organographie Végétale*, t. vii.) But such horizontal rays are not constructed of muriform cellular tissue like real medullary processes, but are composed of ligneous cords lying across the other woody tissue; they are in fact the upper ends of the woody arcs pulled from a vertical into a horizontal direction by the growth of the stem



and the thrusting of the leaves to which they belong from the centre to the circumference. Such a case throws great light upon the real nature of the more regular forms of endogenous wood.

Other appearances are owing to imperfect development, as in some of the aquatic species of this class. *Lemna*, for example, has its stem and leaves fused together into a small lenticular cavernous body; and in *Zosterophyllia* and others, a few tubes of lengthened cellular tissue constitute almost all the axis.

By far the most striking kind of anomaly in the stem of Endogens is that which occurs in *Barbacenia*, and which was originally noticed in the first edition of this work, p. 334. In an unpublished species of *Barbacenia* from Rio Janeiro, allied to *B. purpurea*, the stems appear externally like those of any other rough-barked plant, only that their surface is unusually fibrous and ragged when old, and closely coated by the remains of sheathing leaves when young. Upon examining a transverse section of this stem it is found to consist of a small firm pale central circle having the ordinary endogenous organisation, and of a large number of smaller and very irregular oval spaces pressed closely together but having no organic connection; between these are traces of a chaffy ragged tissue which seems as if principally absorbed and destroyed. A vertical section of the thickest part of this stem exhibits, in addition to a pale central endogenous column, woody bundles crossing each other or lying parallel, after the manner of the ordinary ligneous tissue of a palm stem, only the bundles do not adhere to each other, and are not embodied as usual in a cellular substance. These bundles may be readily traced to the central column, particularly in the younger branches, and are plainly the roots of the stem, of exactly the same nature as those aerial roots which serve to stay the stem of a screw pine (*Pandanus*). When they reach the earth the woody bundles become more apparently roots, dividing at their points into fine segments, and entirely resembling on a small scale the roots of a palm-tree. The central column is much smaller at the base of the stem than near the upper extremity. A figure of this structure will be found under the order *Hamodoraceæ*.

The age of endogenous trees has been little studied. When the circumference of their stem is limited specifically, it is obvious that their lives will be limited also; and hence we find the longevity of palms inconsiderable when compared with that of exogenous trees. Two or three hundred years are estimated to form the extreme extent of life in a date palm and in many others. But where, as in the Dragon Trees, the degree to which the stem will grow in diameter is indefinite, the age seems, as in Exogens, to be indefinite also: thus a famous specimen of the *Dracena Draco*, of *Orative* in *Teneriffe*, was an object of great antiquity so long ago as A. D. 1402, and is still alive.

Important as the character furnished by the internal manner of growth of an Endogen obviously is, it is much enhanced in value by its being found very generally accompanied by peculiarities of organisation in other parts. The leaves have in almost all cases the veins placed in parallel lines, merely connected by transverse single or nearly single bars. Straight-veined foliage is therefore an external symptom of an endogenous mode of growth. When such an appearance is found in Exogens it is always fallacious, and is found to be owing to the excessive size and peculiar direction of a few of the larger veins, and not to be a general character of all the venous system; as is sufficiently obvious in *Rib-grass*, *Gentian*, and many more.



The flowers too of Endogens have in most cases their sepals, petals, and stamens corresponding with the number three, or clearly referrible to that type; and the pistil usually participates in the same peculiarity.

Where such a proportion exists in Exogens, it is usually confined to the sepals and petals by themselves, or to the pistil by itself, not extending to the other organs. In Endogens it is almost universal in all the whorls of the

flower, although sometimes obscured by the abortion, dislocation, or cohesion of particular parts, as happens in the whole of the extensive natural order of grasses.

The effect of the manner of growth in Endogens is to give them a very peculiar appearance. Their trunks frequently resemble columns rising majestically with a plume of leaves upon their summit; and the leaves, often very large—the fan-shaped leaves of some palms are from 20 to 30 feet wide—have most commonly a lengthened form, resembling a sword blade if stiff, or a strap if weak and broad. These peculiarities are connected with others belonging to endogenous vegetation in its most rudimentary condition. The embryo of an Endogen is, in its commonest state, a small undivided cylinder, which protrudes from within its substance a radicle from one end and a plumule from a little above the radicle; in other cases its embryo has a

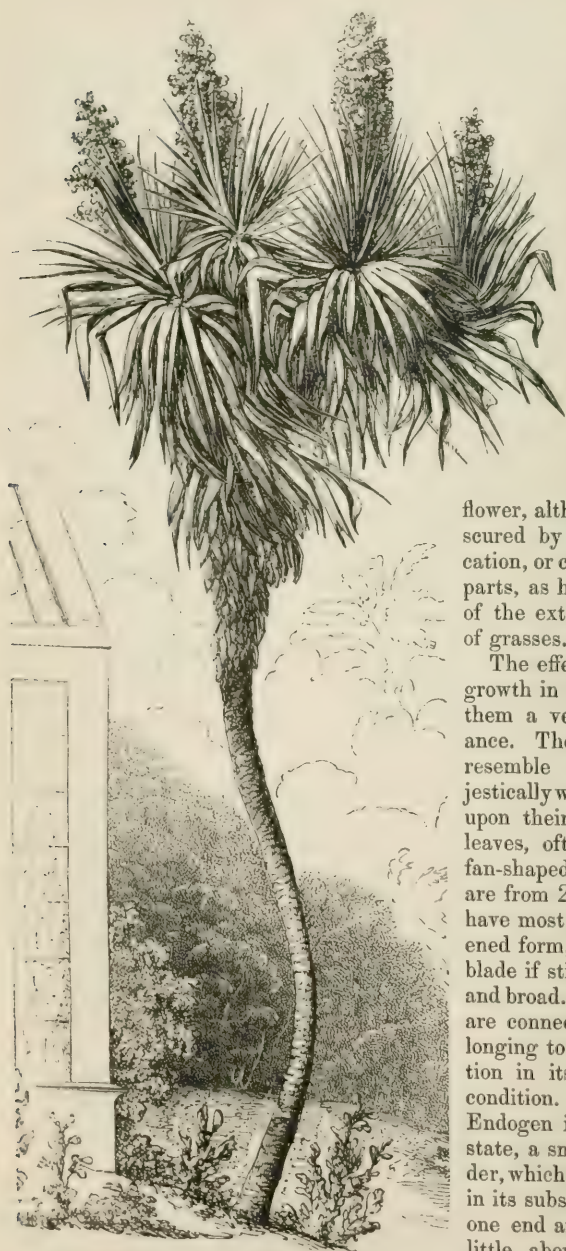


Fig. LXXI.—*Yucca aloifolia*.



slit on one side, in the cavity of which the plumule reposes; or, finally, the embryo is a flat plate as in grasses, with the plumule and radicle attached to its face near the base. In the latter case the flat plate is a solitary cotyledon, which, in the second instance, is folded together *in situ* to give the embryo the appearance of being slit, and which in the first, or more habitual, condition is not only folded up, but united at its edges into a mass entirely burying the plumule and cotyledon. Hence the embryo of an endogen is called *monocotyledonous*; a name that is really inappreciable, notwithstanding the occasional appearance of a second rudimentary cotyledon, as occurs in common wheat. M. Adrien de Jussieu has endeavoured to show that the slit, which is generally supposed to be peculiar to the Arums and their allies, is of general occurrence in the endogenous embryo (*Ann. Sc. N. Ser.* xi. p. 341.)

It has already been stated that the radicle is protruded in germination from within the substance of the embryo: the base of the radicle is consequently surrounded by a minute collar formed of the edges of the aperture produced by the radicle upon its egress. For this reason Endogens are called *endorhizal*.

Hence the great natural class of plants forming the subject of these remarks has five most important physiological peculiarities, by all which combined, or usually by each of which separately, the class may be characterised.

1. The wood is endogenous.
2. The leaves are straight-veined.
3. The organs of fructification are ternary.
4. The embryo is monocotyledonous.
5. The germination is endorhizal.

It may however be readily supposed that, viewed as a large class of plants, Endogens are essentially characterised only by the combination of these five peculiarities, and that occasional deviations may occur from even one of them. Thus in *Najas*, *Caulinia*, *Zatmichellia*, and others, which constitute a part of what Professor Schultz names *Homorganeous floriferous* plants, the whole organisation of the stem is so imperfect that the endogenous character is lost: but their true nature is nevertheless sufficiently indicated by their straight veins, monocotyledonous embryo, &c. The examples of a concentrical arrangement of the woody bundles, above alluded to, may be regarded as instances of endogenous development passing towards the exogenous, and are usually looked upon as cases of transition from one form to the other—perhaps not very correctly. Of a similar nature are the resemblances between the columnar Cycadaceous *Gymnosperms* and Palms, between the livid, fetid, one-sided calyx of *Arctostaphylos* and the equally livid, fetid, one-sided spathe of *Araceous Eulalia*, or, in another point of view, between such lenticular plants as *Limon* in *Endogone*, with the leaves and stems fused, as it were, together, and similar fusion of stem and leaf among *Marchantiaceous Acrogens*.

Really intermediate forms of vegetation connecting Endogens with other classes, are extremely uncommon. One of the most striking is that which occurs between *Ranunculaceæ* and *Nymphaeaceæ* on the part of *Endogone*, and *Alismaceæ* and *Hydrocharaceæ* on that of *Endogone*, if *Hammarhalia lingua*, or better *R. parnassifolius*, is contrasted with *Alisma plantago*, or *Damasonium*, leaving out of consideration subordinate differences. It will be found that there is little of a positive nature to distinguish them except the albuminous dicotyledonous seeds of the former as compared with the axil-



buminous monocotyledonous seeds of the latter; and the resemblances between *Hydropeltis* and *Hydrocharis* in the other case are so very great, that Schultz and others actually refer them to the same class.

Endogens probably contain more plants contributing to the food of man, and fewer poisonous species in proportion to their whole number, than Exogens. Grasses, with their floury albumen, form a large portion of this class, to which have to be added Palms yielding fruit, wine, sugar, sago; Arums, Arrow-roots, Amaryllids, &c., producing arrow-root; the nutritious fruit of Plantains; the aromatic secretions of Gingers; and Orchisworts, forming salep. Among the deleterious species we have no inconsiderable number among Amaryllids, Arums, Melanths, and even Lilies.

In this, as in all other large groups, the extremes of development are so far apart, that one would be tempted to doubt the possibility of their being mere forms of each other, were it not certain that numerous traces exist in the vegetable kingdom of a frequent tendency to produce the typical structure of a natural association of whatever kind in both an exaggerated and degraded state, if such figurative terms may be employed in science. For instance, the genus *Ficus* contains some species creeping on the ground like diminutive herbaceous plants, and others rising into the air to the height of 150 feet, overspreading with the arms of their colossal trunks a sufficient space of ground to protect a multitude of men; the type of organisation in the willow is in like manner represented on the one hand by the tiny *Salix herbacea*, which can hardly raise its head above the dwarf moss and saxifrages that surround it; and on the other by *Salix alba*, a tree sixty feet high. Then among natural orders we have the Rosal structure exaggerated, on the one hand, into the arborescent Pomaceæ, and degraded, on the other, into the apetalous imperfect Sanguisorbeæ; the Myrtal type, highly developed in *Myrtus*, and almost obliterated in Hippurids (Haloragæ); the Urtical, in excess in *Artocarpus*, and quite imperfect in *Ceratophyllum*; Grasses, presenting the most striking differences of perfection between the moss-like *Knappia*, and Bamboos a hundred feet high; and the Liliac in equally different states of development, when *Asparagus* is compared with the Dragon-tree, or an autumnal squill with an arborescent *Yucca*. So, in like manner, we find at one extreme of the organisation of the class of Endogens, Palms, Plantains, and arborescent Liliaceous species, and at the other, such submersed plants as *Potamogeton*, *Zannichellia*, and Duckweed, the latter of which has not even the distinction of leaf and stem, and bears its flowers, reduced to one carpel and two stamens, without either calyx or corolla—and therefore at the minimum of reduction, if to remain flowers at all—in little chinks in its edges.

The classification of Endogens is not a subject upon which there is any very great diversity of opinion among botanists. If the natural orders are sometimes not distinctly limited, they are, upon the whole, grouped much better than those of Exogens; and although it may be expected that some changes have still to be introduced into this part of systematic botany, yet there seems no probability of the limits of the natural orders themselves being disturbed to any considerable extent.

The principles of classification here adopted are the following:—

In the first place, all those numerous species whose flowers are like grasses are stationed by themselves, and constitute the Glumal alliance. They are not perhaps so close upon flowerless plants as some hereafter to be mentioned, but they form, as a whole, the lowest condition of structure to which a great mass of Endogens is reduced. Their flowers may be



regarded as made up of scales, analogous to bracts, without any thing that can be strictly called either calyx or corolla being ever present. They have in many instances the sexes separated; but their glutinous structure overrules this peculiarity.

Next to them seem to be stationed Bulrushes; plants with scales too for their floral envelopes, but arranged in rings, and so falling within the definition of at least a calyx. Their sexes are disunited, and that important circumstance associates them with Palms, Arums, and other arborescent tropical plants, together with a small group of water plants, or Hydrals. This separation of the sexes appears to be a mark of very great importance, when it is complete; and must not be confounded with another kind of separation, in which flowers of one sex have the other sex present in an imperfect condition, and often become actually hermaphrodite. All such cases, although set down in books as monœcious or dioecious, are by no means diclinous, and are excluded from the division containing the Aral Alliance, with the exception of Palms, in which flowers are occasionally altogether hermaphrodite, and which, therefore, form a real exception to the prevailing character of this part of the classification.

The remainder of Endogens are typically hermaphrodite, the number of exceptions to that character being very few. One division of them has the ovary adherent to the calyx and corolla, the other has that organ free, a portion of the Narcissal Alliance having both characteristics. The line of orders thus associated is closed by the Alismal Alliance, some of whose species are almost exogenous as has been already mentioned, while others, being truly diclinous, carry the circle of affinity back to the Hydral Alliance.

#### ALLIANCES OF ENDOGENS.

I. GLUMALES.—*Flowers glutinous; (that is to say, composed of bracts not collected in true whorls, but consisting of imbricated colourless or herbaceous scales).*

II. *Flowers petaloid, or furnished with a true calyx or corolla, or with both, or absolutely naked; ♂ ♀ (that is, having sexes altogether in different flowers, without half-formed rudiments of the absent sexes being present).*

ARALES.—*Flowers naked or consisting of scales, 2 or 3 together, or syncous, and then sessile on a simple naked spadix: embryo oval; albumen mealy or fleshy. (Some have no albumen.)*

PALMALES.—*Flowers perfect (with both calyx and corolla), sessile on a branched scaly spadix; embryo vague, solid; albumen hairy or fleshy. Some Palms are ♂.*

HYDRALES.—*Flowers perfect or imperfect, usually scattered: calyx corolla, without albumen—aquatics. (Some are ♀.)*

III.—*Flowers furnished with a true calyx, and corolla, adherent to the ovary: ♂.*

NARCISSALES.—*Flowers symmetrical; stamens 3 or 6, or more, all perfect; seeds with albumen. (Some Bromeliads have a free calyx and corolla.)*



- AMOMALES.—*Flowers unsymmetrical; stamens 1 to 5, some at least of which are petaloid; seeds with albumen.*
- ORCHIDALES.—*Flowers unsymmetrical; stamens 1 to 3; seeds without albumen.*

IV. *Flowers furnished with a true calyx and corolla, free from the ovary; ♀.*

- XYRIDALES.—*Flowers half herbaceous, 2-3-petaloideous; albumen copious.*
- JUNCALES.—*Flowers herbaceous, dry, and permanent, scarious if coloured; albumen copious. (Some Callas have no albumen.)*
- LILIALES.—*Flowers hexapetaloideous, succulent, and withering; albumen copious.*
- ALISMALES.—*Flowers 3-6-petaloideous, apocarpal; albumen none. (Some Alismaceæ are absolutely ♀ ♂.)*



# ALLIANCE VII. *GLUMALES*.—THE GLUMAL ALLIANCE.

DIAGNOSIS.—*Glumaceous Endogens.*

The great mass of herbage known by the name of Sedges and Grasses, constitutes perhaps a twelfth part of the described species of flowering plants, and at least one-tenth of the number of individuals composing the vegetation of the world; for it is the chief source of that verdure which covers the earth of northern countries with a gay carpet during the months of winter. Such forms of vegetation are provided by nature with true flowers, that is to say, with stamens and pistils, the action of the former of which upon the latter is indispensable for the creation of a seed; but there is little trace of the calyx and corolla, which are commonly characteristic of the more perfect races of plants; not that floral envelopes are wanting, but they do not assume the whorled or ringed position of the parts which form a calyx and corolla; they merely consist of minute green or brown bracts placed one over the other, and sometimes appearing to be united by their edges. There is also great simplicity in their pistil, but one ovule being formed in each cavity, whatever number of carpels (indicated by the stigmas) may be employed in the construction of it. Their foliage is as simple as it can be to have any considerable degree of development, consisting of fine thread-shaped veins running side by side from one end of the leaf to the other.

It is usual to restrict the term *glumaceous* to Grasses and Sedges; but there seems no intelligible reason why the Cordleaves (*Restiaceæ*), Pipeworts (*Eriocaulaceæ*), and Bristleworts (*Dioscoreaceæ*) should be omitted, for they have precisely the same habit and the same substitution of imbricated scales for calyx and corolla. It is only among the Pipeworts that we have the beginning of a calyx, in the form of a membranous tube surrounding the ovary. They do not, however, indicate a more complex condition; rather less so indeed than in Grasses and Sedges; for their pistils are perfectly simple, while those of the latter are invariably formed by the coalition of at least 2 carpellary leaves for each cavity of the ovary.

Two divisions may be formed among the orders, viz. :—

1. Ovule erect or ascending; pistil compound.—*Graminaceæ* and *Cyperaceæ*.
2. Ovules pendulous; pistil simple.—*Dioscoreaceæ*, *Restiacea*, *Eriocaulaceæ*.

The first set touch Palms, the latter Rushes; the whole, in consequence of their spiked-inflorescence, scaly floral envelopes, and great tendency to a separation of the sexes, pass naturally into Bulrush worts (*Typhaceæ*).

## NATURAL ORDERS OF GLUMALS.

Order. 1-celled, with 2 or more distinct (or united) styles; ovule ascending; calyx lateral, naked . . . . .	20. GRAMINACEÆ.
Order. 1-celled, with 2 or more (distinct or) united styles; ovule erect, calyx basal . . . . .	21. CYPERACEÆ.
Order. several (sometimes united) with 1 style to each; ovule pendulous; glumes only; st. 1-2; anths. 1-celled; calyx terminal . . . . .	22. RESTIACEÆ.
Order. 1-2-3-celled, with 2 or 3 styles always; ovule pendulous; glumes only; st. 2-3; anths. 1-celled; calyx terminal . . . . .	23. RESTIACEÆ.
Order. 2-3-celled, with 1 style to each cell; ovule pendulous; glumes 3-lobed sep within the glumes; anthers 2-celled; calyx terminal . . . . .	24. ERIOCAULACEÆ.



## ORDER XXIX. GRAMINACEÆ.—GRASSES.

*Gramina*, Juss. Gen. 28. (1789).—Gramineæ, R. Brown Prodr. 168. (1810); *Paliset de Beauv. Agrostol.*; *Kunth in Mem. Mus.* 2. 62; *Id. in N. G. et Sp. Humb. et Bonpl.* 1. 84; *Turpin in Mém. Mus.* 5. 426; *Trinius Fundam. Agrostol.*; *Dumortier Agrost. Belg.*; *Trinius Diss. de Gram. Unifl. et Sesquif.*; *De la Harpe in Ann. Sc.* 5. 335. 6. 21; *Raspail in Ann. des Sc.* 4. 271. 422. 5. 287. 433. 6. 224. 384. 7. 335; *Nees v. Esenbeck Agrostol. Brasil.*; *Kunth Enum. pl.* vol. 1 et 2; *Endl. Gen.* xlii. *Meisner*, p. 414.

DIAGNOSIS.—*Glumal Endogens*, with split-sheathed leaves, a one-celled ovary, and a lateral naked embryo.

Evergreen herbs, occasionally having stems of considerable size and living for many years. Rhizoma, fibrous or bulbous. Stem cylindrical, usually fistular and closed at



Fig. LXXII.



Fig. LXXIII.

Fig. LXXII.—1. Locusta of *Agrostis alba*; 2. paleæ and stamens, &c. of the same; 3. paleæ of *Leersia oryzoides*; 4. pistil, stamens, and hypogynous scales of the same; 5. locusta of *Polypogon monspeliensis*; 6. paleæ, &c. of the same; 7. locusta of *Stipa pennata*; 8. rachis, bractæ, and florets of *Cynurus cristatus*; 9. locusta of *Cynodon dactylon*; 10. paleæ, and abortive floret of the same.

Fig. LXXIII.—1. Locusta of *Corynephorus canescens*; 2. paleæ, &c. of the same; 3. locusta of *Phalaris aquatica*; 4. locusta of *Alopecurus pratensis*; 5. locusta of *Aira caryophylla*; 6. floret of the same; 7. locusta of *Festuca duriuscula*; 8. locusta of *Glyceria fluitans*; 9. floret of the same; 10. locusta of *Eragrostis poaeformis*.



the joints, covered with a coat of silex, sometimes solid. Leaves narrow and flattened, alternate, with a split sheath, and a membranous expansion all along the junction of sheath and blade. Flowers green in little spikes, called *hæmites*, arranged in an oblique, rounded or parallel manner. Flowers usually 3, sometimes 4 or 5, sometimes 6, ascending of imbricated bracts, of which the most exterior are called *glumes*, the interior more closely enclosing the stamens paleæ, and the innermost at the base of the awn being *glumes* usually 2, alternate; sometimes single, most commonly imbricated. Paleæ 2, alternate: the lower or exterior simple, the upper or interior compound & united by their contiguous margins, and usually with 2 keels, together forming a kind of subcordate shape. Scales 2 or 3, sometimes wanting; if 2, collateral, alternate with the paleæ, and just the lower of them; either distinct or united. Stamens hypogynous, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

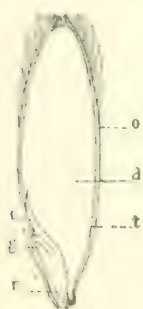


FIG. LXXXV.



FIG. LXXXIV.

on the outside of the plumula, and alternate with the usual cotyledon.

This most important Order offers great singularities in its organisation, although it is one in which, formerly, botanists the least suspected anomalies to exist. They found calyx and corolla and nectaries here with the same facility as they found them in a Ranunculus; and yet such organs exist in no one genus of Grasses. Their so-called flowers consist of green scales, not placed in whorls, but arranged one above the other, and are undoubtedly constructed of bracts alone. Not a trace is discoverable among them of calyx or corolla, properly so called, unless certain scales usually present next the ovary, are to be so considered. Brown's account of their construction is still the best that has been published. He says,—

“The natural or most common structure of Gramineæ is to have their sexual organs surrounded by the floral envelopes, each of which usually consist of two distinct valves; but both of these envelopes are, in many genera of the order, subject to various degrees of imperfection or even suppression of their parts. The outer envelope, or glume, Jussieu, in most cases containing several flowers with distinct and often distant positions on a common receptacle, can only be considered as analogous to the bractee or involucrem of other plants. The tendency to suppression in this envelope appears to be greater in the exterior or lower valve; so that a glume consisting of one valve only, in all cases, be considered as deprived of its outer or inferior valve. In certain genera with a simple spike, as *Lolium* and *Lepturus*, this is clearly proved by the structure of the terminal flower or spikelet, which retains the natural number of parts; and in other genera not admitting of this direct proof, the fact is established by a series of species showing its gradual obliteration, as in those species of *Panicum* which approach that genus with *Paspalum*. On the other hand, in the inner envelope, or calyx of Gramineæ, obliteration first takes place in the inner or upper valve; but this valve is sometimes divided of one central nerve, two nerves equidistant from its axis. I consider it as composed of two confluent valves, analogous to what takes place in the calyx and corolla of many irregular flowers of other classes; and this confluence may be regarded as the first step towards its obliteration, which is complete in many species of *Panicum*, in *Aeluropus*, *Pappophorum*, *Alopecurus*, *Trichodum*, and several other genera. With respect to the nature of this inner or proper envelope of Grasses, it may be asserted, that the view of its structure now given, in reducing its parts to the usual ternary division of Stamens, ledons, affords an additional argument for considering it as the true perianthium. This argument, however, is not conclusive, for a similar confluence takes place between the two inner lateral bractee of the greater part of Fructes; and with them, in the obliteration of its valves, the proper envelope of Grasses may be supposed much better to accord than with a genuine perianthium. If, therefore, the inner envelope of Gramineæ



be regarded as consisting merely of bracteæ, the real perianthium of the order must be looked for in those minute scales, which, in the greater part of its genera, are found immediately surrounding the sexual organs. The scales are, in most cases, only two in number, and placed collaterally within the inferior valve of the proper envelope. In their real insertion, however, they alternate with the valves of this envelope, as is obviously the case in *Ehrharta* and certain other genera; and their collateral approximation may be considered as a tendency to that confluence which uniformly exists in the parts composing the upper valve of the proper envelope, and which takes place also between these two squamæ themselves, in some genera, as *Glyceria* and *Melica*. In certain other genera, as *Bambusa* and *Stipa*, a third squamula exists, which is placed opposite to the axis of the upper valve of the proper envelope, or, to speak in conformity with the view already taken of the structure of this valve, opposite to the conjunction of its two component parts. With these squamæ the stamina in triandrous Grasses alternate, and they are consequently opposite to the parts of the proper envelope; that is, one stamen is opposed to the axis of its lower or outer valve, and the two others are placed opposite to the two nerves of the upper valve. Hence, if the inner envelope be considered as consisting of bracteæ, and the hypogynous squamæ as forming the perianthium, it seems to follow, from the relation these parts have to the axis of inflorescence, that the outer series of this perianthium is wanting, while its corresponding stamina exist, and that the whole or part of the inner series is produced while its corresponding stamina are generally wanting. This may, no doubt, actually be the case; but as it would be, at least, contrary to every analogy in Monocotyledonous plants, it becomes in a certain degree probable that the inner or proper envelope of Grasses, the calyx of Jussieu, notwithstanding the obliquity in the insertion of its valves, forms in reality the outer series of the true perianthium, whose inner series consists of the minute scales, never more than three in number, and in which an irregularity in some degree analogous to that of the outer series generally exists. It is necessary to be aware of the tendency to suppression existing, as it were, in opposite directions in the two floral envelopes of Grasses, to comprehend the real structure of many irregular genera of the order, and also to understand the limits of the two great tribes into which I have proposed to subdivide it. One of these tribes, which may be called *Panicææ*, comprehends *Ischæmum*, *Holcus*, *Andropogon*, *Anthistiria*, *Saccharum*, *Cenchrus*, *Isachne*, *Panicum*, *Paspalum*, *Reimaria*, *Anthenantia*, *Monachne*, *Lappago*, and several other nearly related genera; and its essential character consists in having always a locusta of two flowers, of which the lower or outer is uniformly imperfect, being either male or neuter, and then not unfrequently reduced to a single valve. *Ischæmum* and *Isachne* are examples of this tribe in its most perfect form, from which *Anthenantia*, *Paspalum*, and *Reimaria*, most remarkably deviate, in consequence of the suppression of certain parts: thus *Anthenantia* (which is not correctly described by Palisot de Beauvois) differs from those species of *Panicum* that have the lower flower neuter and bivalvular, in being deprived of the outer valve of its gluma; *Paspalum* differs from *Anthenantia* in the want of the inner valve of its neuter flower, and from those species of *Panicum* whose outer flower is univalvular, in the want of the outer valve of its gluma; and *Reimaria* differs from *Paspalum* in being entirely deprived of its gluma. That this is the real structure of these genera may be proved by a series of species connecting them with each other, and *Panicum* with *Paspalum*. The second tribe, which may be called *Poacææ*, is more numerous than *Panicææ*, and comprehends the greater part of the European genera, as well as certain less extensive genera peculiar to the equinoctial countries; it extends also to the highest latitudes in which Phenogamous plants have been found; but its maximum appears to be in the temperate climates, considerably beyond the tropics. The locusta in this tribe may consist of 1, 2, or of many flowers; and the 2-flowered genera are distinguished from *Panicææ* by the outer or lower flower being always perfect, the tendency to imperfection in the locusta existing in opposite directions in the two tribes. In conformity with this tendency in *Poacææ*, the outer valve of the perianthium in the single-flowered genera is placed within that of the gluma, and in the many-flowered locusta the upper flowers are frequently imperfect. There are, however, some exceptions to this order of suppression, especially in *Arundo Phragmites*, *Campulosus*, and some other genera, in which the outer flower is also imperfect: but as all of these have more than two flowers in their locusta, they are still readily distinguished from *Panicææ*." *Brown in Flinders*, 580.

According to this view, in a locusta of several florets, the scales at its base, or glumes, are bracts, and each floret consists of a calyx formed of one sepal remote from the rachis, and two cohering by their margins and next the rachis; the little hypogynous scales are the rudiments of two petals, and the stamens alternate with these in the normal manner. This may be rendered more clear by the following diagram, in which the triangle A B B represent the outer series, or paleæ, or calyx, A being the inferior valve, and B B the superior, formed of two sepals united by their con-







curious and important details relating to the structure and affinities of the genera of Grasses.

The stem of Grasses seems to be so much at variance in structure with that of other Endogens, as to have led Agardh to remark, that it is the least monocotyledonous of all Monocotyledonous plants. It is probable, however, that its peculiarity does not depend so much upon any specific deviation from the ordinary laws of growth, as upon a separation of the parts at an early period of their growth. The stem of a Grass, it must be remembered, exists in two different states,—that of the rhizome, and of the straw: the rhizome, which is the true trunk; and the straw, which may be considered a ramification of it. The rhizome grows slowly, and differs in no respect from the stem of other Monocotyledons, as is evident in that of the Bamboo. The straw, on the contrary, which grows with great rapidity, is fistular, with a compact impervious diaphragm at each articulation; a fact which must be familiar to every one who has examined corn, or the joint of a Bamboo. In the beginning, when this straw was first developed, it was a solid body like the rhizome, only infinitely smaller; but in consequence of the great rapidity of its development, the cellular tissue formed more slowly than the woody vascular bundles which it connects, and in consequence a separation takes place between the latter and the former, except at the articulations, where, by the action of the leaves, and their axillary buds, is formed a plexus of vessels, which, growing as rapidly as the straw, distends, and therefore never separates in the centre. Something analogous to this occurs in the flowering stem of the common Onion among Monocotyledons, and in Umbellifera among Dicotyledons. The stem of Grasses is not, however, always hollow; in the Sugar Cane it is solid, as in common Endogens.

The relation that exists between Palms and Grasses will be adverted to in speaking of the former order: Nees v. Esenbeck considers Grasses to be a sort of Palms of a lower grade. In reality, the habit of the genera *Calamus* and *Bambusa* is nearly alike; the inflorescence of Grasses may be considered to be the same as that of Palms, the floral envelopes of the latter taken away, and only their bracts remaining; and, finally, the leaves are formed upon exactly the same plan, with this difference only, that those of Grasses are undivided. With Sedges, however, it is that Grasses are most properly to be compared. While a manifest tendency, at least to the degree of verticillation requisite to constitute a calyx, evidently takes place in the paleæ of Grasses, Sedges are destitute of all trace of such a tendency, unless the opposite connate glumes of the female flowers of *Carex*, or the hypogynous scales of certain Schoeni and others, be considered an approach to the production of a perianth. For this reason, Grasses may be considered plants in a higher state of evolution than Sedges. Independently of this difference, the orders are usually known by the stems of Grasses being hollow, those of Sedges solid; the leaves of Grasses having a ligula at the apex of their sheath, which is split, while the sheath of Sedges is not split, and is destitute of this ligula; and, finally, the embryo of Grasses is external, lateral, and with a naked plumule, while that of Sedges is undivided and enclosed within the base of the alumen.

As nothing can be uninteresting which is connected with the habits of a tribe of such vast importance to man, I extract the following account of the geographical distribution of Grasses by Schouw, from Jameson's *Philosophical Journal for April*, 1825:—"The family is very numerous: Persoon's *Synopsis* contains 312 species, 1-26th part of all the plants therein enumerated. In the system of Roemer and Schultes there are 1800; and, since this work, were it brought to a conclusion, would probably contain 40,000 in all, it may be assumed that the Grasses form a 22nd part. It is more than probable, however, that in future the Grasses will increase in a larger ratio than the other phanerogamic plants, and that perhaps the just proportion will be as 1 to 20, or as 1 to 16. Greater still will be their proportion to vegetation in general, when the number of individuals is taken into account; for, in this respect, the greater number, nay perhaps the whole of the other classes, are inferior. With regard to locality in such a large family, very little can be advanced. Among the Grasses there are both land and water, but no marine, plants. They occur in every soil, in society with others, and alone; the last to such a degree as entirely to occupy considerable districts. Sand appears to be less favourable to this class; but even this has species nearly peculiar to itself. The diffusion of this family has almost no other limits than those of the whole vegetable kingdom. Grasses occur under the equator; and *Agrostis alga* was one of the few plants which Phipps met with on Spitzbergen. On the mountains of the south of Europe, *Poa disticha* and other Grasses ascend almost to the snow line; and, on the Andes, this is also the case with *Poa malulensis* and *dactyloides*, *Deyeuxia rigida* and *Festuca dasyantha*.

"The greatest differences between tropical and extra-tropical Grasses appear to be the following:—1. The tropical Grasses acquire a much greater height, and occasionally



assume the appearance of trees. Some species of *Bambusa* are found 30 to 40 feet high. 2. The leaves of the tropical Grasses are broader, and at least three as long as those of other families of plants. Of this the genus *Paspalum* affords many examples. 3. Separate sexes are more frequent in the tropical Grasses. *Zizania*, *Setaria*, *Andropogon*, *Styria*, *Anthistiria*, *Ischaemum*, *Ægilops*, and many other genera, which only occur in the torrid zone, and are there found in perfection, are monœcious, or polyœcious. *Holcus* is perhaps the only extra-tropical genus with separate sexes. 4. The *Holcus* culture, more downy, and elegant. 5. The extra-tropical Grasses, on the contrary, are more numerous in tropical in respect of the number of individuals. That except among 1916, which, especially in the colder parts of the temperate zones, in spring and summer, occupies the green meadows and pastures, is almost entirely wanting in the torrid zone. The Grasses there do not grow crowded together, but, like other plants, more detached. Even in the southern parts of Europe, the assimilation to the warmer regions, in this respect, is by no means inconsiderable. *Arundo donax*, by its height, reminds us of the Bamboo; *Saccharum Ravenna*, S. Teneriffe, *Imperata arundinacea*, *Lycurus scariosus*, *Lygeum spartum*, and the species of *Andropogon*, *Ægilops*, &c. by separate sexes, exhibit tropical qualities. The Grasses are also less gregarious, and meadows are almost absent, in the south than in the north of Europe. The generality are sown plants.

6. The distribution of cultivated Grasses is one of the most interesting of all subjects. It is determined, not merely by climate, but depends on the civilisation, industry, and traffic of the people, and often on historical events. Within the northern polar circle, agriculture is found only in a few places. In Siberia grain reaches at the utmost only to 60°, in the eastern parts scarcely above 55°, and in Kamtschatka there is no agriculture even in the most southern parts (51°). The polar limit of agriculture on the North-west coast of America appears to be somewhat higher; for, in the most northern Russian possessions (57° to 52°), barley and rye come to maturity. On the east coast of America it is scarcely above 50° to 52°. Only in Europe, namely, in England, does the polar limit reach an unusually high latitude (70°). Beyond this, dried fish, and there potatoes, supply the place of grain. The grains which extend farthest to the north in Europe are barley and oats. These, which in the milder climates are not used for bread, afford to the inhabitants of the northern parts of Norway and Sweden, as a part of Siberia and Scotland, their chief vegetable nourishment. Rye is the next which becomes associated with these. This is the prevailing grain in a great part of the northern temperate zone, namely, in the south of Sweden and Norway, Denmark, and in all the lands bordering on the Baltic; the north of Germany, and part of Siberia. In the latter another very nutritious grain, buck-wheat, is very frequently cultivated. In the zone where rye prevails, wheat is generally to be found; barley being here chiefly cultivated for the manufacture of beer, and oats supplying food for the horses. To these three follows a zone in Europe and western Asia, where rye disappears, and wheat almost exclusively furnishes bread. The middle, or the south of France, England, part of Scotland, a part of Germany, Hungary, the Crimea and Caucasus, is also the home of middle Asia, where agriculture is followed, belong to this zone. Here the vine becomes found; wine supplants the use of beer; and barley is consequently less useful. Next comes a district where wheat still abounds, but no longer exclusively furnishes bread, rice and maize becoming frequent. To this zone belong Portugal, Spain, part of France on the Mediterranean, Italy, and Greece; further, the countries of the South, Persia, northern India, Arabia, Egypt, Nubia, Barbary, and the Canary Islands; in these latter countries, however, the culture of maize or rice towards the south, is always more considerable, and in some of them several kinds of sorghum (doura) and the *Holcus* come to be added. In both these regions of wheat, rye only occurs at a considerable elevation; oats, however, more seldom, and at last entirely disappear; barley becoming food for horses and mules. In the eastern parts of the temperate zone of the Old Continent, in China and Japan, our northern kinds of grain are very plentiful, but rice is found to predominate. The cause of this difference between the east and the west of the Old Continent appears to be in the manners and population of the people. In North America, wheat and rye grow as in Europe, but more sparingly. Maize is more reared in the Western than in the Old Continent, and rice predominant in the southern provinces of the United States. In the torrid zone, rice predominates in America, rice in Asia, and both these grains in nearly equal quantities in Africa. The cause of this distribution is, without doubt, interesting for Asia is the native country of rice, and America of maize. In some situations, especially in the neighbourhood of the tropics, wheat is also met with, but always subordinate to these other kinds of grain. Besides rice and maize, there are, in the torrid zone, several kinds of grain, as well as other plants, which supply the inhabitants with food, either used along with them, or entirely occupying their place. Such are, in the New Continent, yams (*Dioscorea alata*), the manioc (*Manihot*), and the batatas



(*Convolvulus batatas*), the root of which, and the fruit of the pisang (Banana *Musa*),

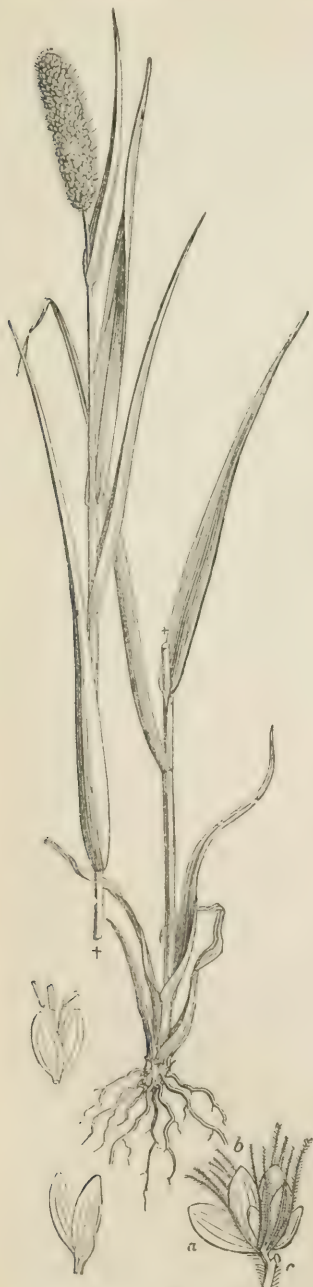


Fig. LXXVII.—*Setaria glauca*.

furnish universal articles of food. In the same zone, in Africa, doura (sorghum), pisang, manihot, yams, and *Arachis hypogæa*. In the East Indies, and on the Indian Islands, Eleusine coracana, *E. stricta*, *Panicum frumentaceum*; several palms and Cycadææ, which produce the sago; pisang, yams, batatas, and the breadfruit (*Artocarpus incisa*). In the islands of the South Sea, grain of every kind disappears, its place being supplied by the bread-fruit tree, the pisang, and *tacca pinnatifida*. In the tropical parts of New Holland there is no agriculture, the inhabitants living on the produce of the sago, of various palms, and some species of Arum. In the high lands of South America there is a distribution similar to that of the degrees of latitude. Maize, indeed, grows to the height of 7200 feet above the level of the sea, but only predominates between 3000 and 6000 of elevation. Below 3000 feet it is associated with the pisang, and the above-mentioned vegetables; while, from 6000 to 9260 feet, the European grains abound: wheat in the lower regions, and rye and barley in the higher; along with which *Chenopodium Quinoa*, as a nutritious plant, must also be enumerated. Potatoes alone are cultivated from 9260 to 12,300 feet. To the south of the tropic of Capricorn, wherever agriculture is practised, considerable resemblance with the northern temperate zone may be observed. In the southern parts of Brazil, in Buenos Ayres, in Chile, at the Cape of Good Hope, and in the temperate zone of New Holland, wheat predominates; barley, however, and rye, make their appearance in the southernmost parts of these countries, and in Van Diemen's Land. In New Zealand the culture of wheat is said to have been tried with success; but the inhabitants avail themselves of the *Acrostichum furcatum* as the main article of sustenance. Hence it appears, that, in respect of the predominating kinds of grain, the earth may be divided into five grand divisions, or kingdoms. The kingdom of rice, of maize, of wheat, of rye, and lastly of barley and oats. The first three are the most extensive; the maize has the greatest range of temperature; but rice may be said to support the greatest number of the human race."

It is a very remarkable circumstance, that the native country of wheat, oats, barley, and rye, should be entirely unknown; for although oats and barley were found by Col. Chesney apparently wild on the banks of the Euphrates, it is doubtful whether they were not the remains of cultivation. This has led to an opinion, on the part of some persons, that all our cereal plants are artificial productions, obtained accidentally, but retaining their habits, which have become fixed in the course of ages. This curious subject has been discussed in the *Gardeners' Chronicle* for 1844, p. 555, 779, &c., whither the reader is referred for further information.



The uses of this most important tribe of plants, for fodder, food, and clothing, require little illustration. The abundance of which some families contain in their seeds renders them peculiarly well adapted for the sustenance of man; and of the Cereæ Grasses only, such as Wheat, Barley, Rye, Oats, Maize, Rice, and Guinea Corn, and the kinds commonly employed, it is because of the large size of their grains compared with that of other Grasses; for none are unwholesome in their natural state, with the exception of *Lolium temulentum*, a common weed in some parts of England, the effects of which are undoubtedly deleterious, although perhaps the quantity of *Trifolium purpureum* and cathartics, said to be emetic and purgative; but *Eleusine molle*, supposed to be unwholesome, and of *Festuca quadriflorata*, which is said to be poisonous in India, where it is called Pignonil. To these must be added *Molinia varia*, in grain so deadly, according to Eendicher; and a variety of *Paspalum scrubiculatum*, called Hareet in India, (*Cryptanthus Pictus*, *Planta*, p. 274), which is perhaps the Glorious Grass, a very Indian poisonous species, said to render the milk of cows that graze upon it entirely undrinkable. (*Madras Journal*, 1837, p. 107.) It is however uncertain how far the deleterious action of some of these may be owing to mechanical causes, which, in the case of the species of *Calamagrostis* and *Stipa* seem to be the cause of mischief in consequence of their roughness and bristles. In their qualities the poisonous species seem to approach the properties of putrid Wheat, which is known to be dangerous.

Among corn plants less generally known may be mentioned *Eleusine indica*, called Natchee, on the Coromandel coast, and Nagla Rice, or Maiz, elsewhere in India; *Ustilaria camariensis*, which yields the corn seed; *Zizania aquatica* or Canada Rice; *Paspalum scrubiculatum*, the Monya or Kachro of India, a cheap grain, reported to be unwholesome; some; *Setaria germanica*, yielding German millet; *Panicum frumigenum*, called Shamoola, in the Deccan; *Setaria italica*, cultivated in India under the name of baikangnee or Kora Lang; *Panicum maximum*, a grain called Wares in India; and *P. pilosum*, called Bhadlee. *Penicillaria spicata* or Bajree; *Andropogon Sagorum* or Durra, Doora, Jowaree or Jondla; and *Andropogon squaratus* or Shalee, are also grown in India for their grain. A kind of fine-grained corn, called, on the coast of Africa, Fondi or Fundungi, is produced by *Paspalum exile*; and finally, both the Teff and Tamas Abyssinian corn plants, are species of this order; the former *Poa abyssinica*, the latter *Eleusine Tocussa*, (*China*, 1839). Even *Stipa pennata* is said to produce a flour nearly like that of Rice.

The value of Grasses as fodder for cattle is hardly second to that of their use for human food. The best fodder Grasses of Europe are usually dwarf species, or at least such as do not rise more than 3 or 4 feet above the ground, and of these the larger kinds are apt to become hard and wiry; the most esteemed are *Lolium perenne*, *Polygonum* and *Festuca pratensis*, *Cynosurus cristatus*, and various species of *Poa* and *Hordeum*, to which should be added *Anthoxanthum odoratum* for its fragrance. For the fodder Grasses of Brazil are of a far more gigantic stature, and perfectly tender and delicate. We learn from Nees von Esenbeck, that the Capim de Amara of Brazil, *Panicum spectabile*, grows 6 or 7 feet high; while other equally gigantic species substitute the field crops on the banks of the Amazons. In New Holland the largest of the *Anthistria australis* or Kangaroo Grass; in India the *A. ciliata* is also in request. But the most common Indian fodder Grass appears to be *Drosera*, *Durra*, or *Hurreelee*, *Cynodon Dactylon*. Gama Grass, *Tripsacum dactyloides*, has a great reputation as fodder in Mexico; and attention has lately been directed to the *Timoteum* of the Falklands, *Festuca flabellata*, a species forming tufts 5 or 6 feet high, and said to be unrivalled for its excellence as food for cattle and horses. (See *Annals of Agriculture*, 1843, p. 131).

The fragrance of our sweet Vernal Grass (*Anthoxanthum*), is by no means confined to it. Other species are *Hieracloa borealis*, *Auxia Henshelia*, and some *Andropogon*; their odour is said to be owing to the presence of benzene acid. The most fragrant species are *Andropogon Iwarancusa* and *Scleranthus*, the latter the Sweet Grass of English gardens; *A. Calamus aromaticus*, which Dr. Royle considers the plant of that name described by Dioscorides, and the "sweet cane" and "rich scented root from a far country" of Scripture; and the *Anatherum muricatum*, called Valtree by the French, and Klus in India, where its fragrant roots are employed in making incense, covers for palanquins, &c.

This fragrance is connected with aromatic substances which have in past recommended Grasses to the notice of medical practitioners. The last mentioned plant (*Anatherum muricatum*), is said to be acrid, aromatic, stimulating, and digestive; another species, *A. Nardus*, is called, because of its quality, *Ganga Grass*, or *Kastal*. The roasted leaves of *Andropogon Scherardii* are used in India, to induce, as an excellent stomachic. An essential oil of a pleasant taste is extracted from the leaves in the Moluccas; and the Javanese esteem the plant good for a cold, headache, and



stimulant. (*Ainslie*, ii. p. 58.) The former is one of the Grass oils of Nemauro, called in India Ivarancusa, and described in *Brewster's Journal*, ix. p. 333. Many others partake of the same qualities. But it is not merely for their aroma that Grasses are used medicinally. A cooling drink is employed in India from the roots of *Cynodon Dactylon*. The hard stony fruits of *Coix Lacryma* (Job's-tears), have been supposed to be strengthening and diuretic; and the latter quality has been recognised in many others, especially the common Reeds, *Phragmites arundinacea* and *Calamagrostis* in Europe, *Perotis latifolia* in the West Indies, and the Brazilian species of *Gynerium*. A decoction of *Eleusine indica* is employed in Demerara, in the convulsions of infants, according to Schomburgk. *Donax arundinacea* is astringent and subacid. The creeping roots of the Quitch or Quick Grass, *Triticum repens*, of Tr. glaucum and junceum and *Cynodon Dactylon* and lineare, have some reputation as a substitute for Sarsaparilla. A decoction of the root of *Gynerium parviflorum* is used in Brazil to strengthen the hair.

Sugar is a general product of Grasses. *Gynerium saccharoides*, a Brazilian Grass, derives its name from that circumstance. It exists in great quantity in the Sugar-cane (*Saccharum officinarum*); Maize so abounds in it that its cultivation has been proposed in lieu of the Sugar-cane; and it is probable that the value of other species for fodder depends upon the abundance of this secretion.

For economical purposes Grasses are often of much importance. The strong stems of the Bamboo are employed instead of timber and cordage. The *Arundo arenaria* and *Elymus arenarius* (Marrum Grasses) are invaluable species for keeping together the blowing sands of the sea-coast, by their creeping suckers and tough entangled roots. The first is employed in the Hebrides for many economical purposes, being made into ropes for various uses, mats for pack-saddles, bags, hats, &c. Some of the Reeds of Brazil, called Taquarussa, are living fountains: they grow from 30 to 40 feet high, with a diameter of six inches, form thorny impenetrable thickets, and are exceedingly grateful to hunters; for, on cutting off such a Reed below a joint, the stem of the younger shoots is found to be full of a cool liquid, which quenches the most burning thirst. Reeds and other coarse species furnish in Europe the materials for thatching. The reeds (sometimes 16 feet long), from which the Indians of Esmeralda form the tubes whence they blow the arrows poisoned with the deadly Urari or Woorari, are single internodes of the *Arundinaria Schomburgkii*. (*Linn. Trans.* xviii. p. 562.) A coarse but good sort of soft paper is manufactured in India from the tissue of the Bamboo, and the very young shoots of that plant are eaten like Asparagus.

Besides these things the inorganic products are remarkable. That the cuticle contains a large proportion of silex, is proved by its hardness, and by masses of vitrified matter being found whenever a hay-stack or heap of corn is accidentally consumed by fire. In the joints of some Grasses a perfect siliceous deposit is found, particularly in a kind of Jungle Grass mentioned in a letter from Dr. Moore to Dr. Kennedy of Edinburgh. It is also said that Wheat-straw may be melted into a colourless glass with the blow-pipe, without any addition. Barley-straw melts into a glass of a topaz yellow colour. The siliceous matter of the Bamboo is often secreted at the joints, where it forms a singular substance called tabasheer, of which see a very interesting account in *Brewster's Journal*, viii. p. 268. It was found by Turner that the tabasheer of India consisted of silica containing a minute quantity of lime and vegetable matter. Sulphur exists, in combination with different bases, in Wheat, Barley, Rye, Oats, Maize, Millet, and Rice.

For an account of the disease called Ergot, see p. 39, in the Fungal Alliance. It seems to be found in all Grasses, but most abundantly in Rye and Maize. When mixed with flour, in any quantity, it causes a mortification of the limbs, and the most horrible poisoning. Medical men have however found it to exercise a decidedly powerful stimulant effect upon the uterus, on which account it is now frequently and successfully employed by European practitioners in cases of difficult parturition.\* The ergot

\* Ergot is a disease which causes the grain of Rye to lengthen, harden, turn black, and form horns or spurs upon the ears. Where Rye is the food of man or of cattle, most dreadful consequences have followed the use of the spurred grains. Some curious observations have lately been made upon it by M. Bonjean. He says that the action on animals is extremely similar to that of morphia, although it in fact contains no trace of that substance. The first effect is to produce a loss of appetite and stupefaction; when it begins to act, dogs howl frightfully until they are completely under its influence, and then lie down and groan. In fowls the comb and crop become black. It appears that the Ergot which breaks with a white fracture is quite as dangerous as that which is violet; but until it is quite ripe it has no dangerous action; six or eight days are sufficient for its maturity, and even its being very old, hard, and dry seems in no way to impair its venomous qualities. M. Bonjean adds that Ergot contains two principles entirely different: one, of an oily nature, is venomous; the other, of a watery character, is harmless, but produces the extraordinary medical effects for which Ergot is employed—in particular in stopping the most frightful cases of hemorrhage. He asserts that the watery part, which he calls hæmostatic extract, may be prepared without difficulty, and that he has administered as much as 2 drachms of it, which is equal to 9 or 10 drachms of the Ergot, without any dangerous consequences.

The best Ergot is obtained from Rye which is grown on dry, airy, elevated regions, and where the



of Maize is, according to Raulin, very common in Colombia, and the use of it is attended with a shaking of the hair, and even the death of both man and beast. Maize fed on it lose their hoofs, and both lay down without food. The better than the maize is as powerful as that of Rye, wheat, or perhaps barley. The common name of the Maize thus affected is *Maiz poisonoso*. This statement, however, requires confirmation.

## GENERAL.

## I.—(continued).

*Leptocarpus*, *Sed.*  
*Asplenium*, *Schreb.*  
*Hymenophyllum*, *Sw.*, *Mik.*  
*Polypodium*, *Sw.*, *Br.*, *Hb.*  
*Pellaea*, *Sw.*, *Georg.*  
*Osmunda*, *Sw.*  
*Adiantum*, *Kunth.*  
*Pteridium*, *Sw.*, *R. Br.*  
*Hydrochloron*, *P. Br.*  
*H. nemorosum*, *Sw.*  
*Melobesia*, *Sw.*  
*Zosterophyllum*, *Sw.*  
*Hypolepis*, *Sw.*  
*Cayana*, *Sw.*  
*Asplenium*, *Schreb.*  
*Leptocarpus*, *Sw.*  
*Leptocarpus*, *Sw.*  
*Tetrarrhena*, *R. Br.*  
*Microlepia*, *R. Br.*  
*Diplaz*, *Sw.*  
*Polypodium*, *R. Br.*  
*Leptocarpus*, *P. Br.*

11 — *Pl. de l'Inde.*

*Lychnis, L.*  
*Zea, L.*  
*Cela, L.*  
*Althæa rosea, G. R. Th.*  
*Clematis, R. Br.*  
*Sorbus, L. & Br.*  
*Maydis, R. Br.*  
*Cornus, C. Linn.*  
*Cappella, id.*  
*Althæa rosea, G. R. Th.*  
*Hibiscus, L. H. B.*  
*Morus, Linn.*  
*Sorbus, Linn.*  
*Clematis, R. Br.*  
*Alopecurus, L.*  
*Convolvulus, Pallas.*  
*Lychnis, Linn.*  
*Beckmannia, H. B.*  
*Lychnis, Linn.*  
*Phleum, L.*  
*Sorbus, Linn.*  
*Clematis, Pallas.*  
*Althæa rosea, Pallas.*  
*Althæa, L. H.*  
*Fraxinella, A. N.*  
*Cornus, Linn.*  
*Lychnis, Linn.*  
*Hibiscus, L. & K.*  
*Hibiscus, Presl.*  
*Phleum, Linn.*  
*Drosera, Linn.*  
*Lychnis, G. R. Th.*  
*Phleum, Linn.*  
*Hibiscus, Linn.*  
*Lychnis, Linn.*  
*Desmodium, Linn.*

III. *Proprietary*[illegible]

Author's address: School of Information Systems, Singapore Management University, Singapore 178902.

[illegible]IV.—*Summary*[illegible]

V.—*Agrostææ*.

[illegible]

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1. *Chrysomelidae*, *Chrysomelinae*  
 2. *Chrysomelidae*, *Chrysomelinae*  
 3. *Chrysomelidae*, *Chrysomelinae*  
 4. *Chrysomelidae*, *Chrysomelinae*  
 5. *Chrysomelidae*, *Chrysomelinae*

## VI

S. ...  
 D. ...  
 A. ...  
 T. ...  
 Arund. ...  
 D. ...  
 S. ...  
 A. ...  
 Graph. ...  
 D. ...  
 Amp. ...  
 G. ...

VIII. *De la géométrie*[illegible]VIII — *Continued*[illegible][illegible]



*Campulosa*, Desv.  
*Campulosus*, Palis.  
*Monocera*, Elliot.  
*Monothera*, Raf.  
*Melanocenchris*, Nees.  
*Chondrosium*, Desv.  
*Actinochloa*, Willd.  
*Bouteloua*, Lagasc.  
*Opizia*, Presl.  
*Spartina*, Schreb.  
*Limnetis*, Rich.  
*Trachynotia*, Michx.  
*Ponceletia*, Thouars.  
*Eutriana*, Trin.  
*Atheropogon*, Mühlent.  
*Aristidium*, Endl.  
*Heterostegia*, Desv.  
 ? *Enteropogon*, Nees.  
*Triplathera*, Endl.  
*Triathera*, Desv.  
*Gymnopogon*, Palis.  
*Polyodon*, H. B. K.  
*Pentarthaphis*, H. B. K.  
*Polyschistis*, Presl.  
*Triena*, H. B. K.  
*Triplasis*, Palis.  
*Pleuraphis*, Torrey.  
*Bromidium*, Nees.

IX.—*Avenac.*

*Hierochloa*, Gmel.  
*Disarrhenum*, Lab.  
*Dimeria*, Raf.  
*Anthoxanthum*, L.  
*Ataxia*, R. Br.  
*Podopogon*, Ehrenb.  
*Corynephorus*, Palis.  
*Weingartneria*, Bernh.  
*Deschampsia*, Palis.  
*Campella*, Lk.  
*Dupontia*, R. Br.  
*Aira*, L.  
 ? *Periballia*, Trin.  
 ? *Poidium*, Nees.  
*Airopsis*, Desv.  
*Trisetaria*, Forsk.  
*Lagurus*, L.  
*Trisetum*, Kunth.  
*Colobanthus*, Trin.  
*Rostraria*, Trin.  
*Kaleria*, Lk.  
*Trichæta*, Palis.  
*Acrospilon*, Bess.  
*Ventenata*, Kol.  
*Avena*, Linn.  
 ? *Lepidopyrum*, Rafin.  
*Gaudinia*, Palis.  
*Arthrostachya*, Lk.  
*Arrhenatherum*, Palis.  
*Tristachya*, Nees.  
*Monopogon*, Presl.  
*Anisopogon*, R. Br.  
*Trichopterya*, Nees.  
*Eriachne*, R. Br.  
*Achneria*, Palis.  
*Brandtia*, Kunth.  
*Danthonia*, DC.  
*Sieglingia*, Bernh.  
*Triodia*, Palis.  
*Triopogon*, Röm. et Sch.  
*Triathera*, Roth.  
*Pentameris*, Palis.  
*Chaetobromus*, Nees.  
*Uralapis*, Nutt.  
*Diplocera*, Rafin.  
*Windsoria*, Nutt.  
*Tricuspis*, Palis.  
*Tridens*, Röm. et Sch.  
*Triodia*, R. Br.  
*Pommereulla*, Lin. fil.

X.—*Festuceæ.*\**Bromidæ.*

*Sesleria*, Ard.  
*Oreochloa*, Lk.  
*Psilathera*, Lk.  
*Poa*, L.  
*Æluropus*, Trin.  
*Brizopyrum*, Lk.  
*Distichis*, Raf.  
*Eragrostis*, Palis.  
*Megastachya*, Palis.  
*Dissanthelium*, Trin.  
*Tetrachne*, Nees.  
*Phalaridium*, Nees.  
*Centotheca*, Desv.  
*Glyceria*, R. Br.  
*Devauxia*, Lk.  
*Hydrochloa*, Lk.  
*Exydra*, Endl.  
*Lophochlana*, Nees.  
*Pleuropogon*, R. Br.  
*Eatonia*, Raf.  
*Reboulia*, Kunth.  
 ? *Chondrasyrum*, Nees  
*Catabrosa*, Palis.  
*Celachne*, R. Br.  
*Briza*, L.  
 ? *Neurotoma*, Raf.  
*Chascolytrum*, Desv.  
*Calotheca*, Kunth.  
*Anthochloa*, Nees.  
*Melica*, L.  
*Bubilis*, Rafin.  
*Molinia*, Möench.  
*Airochloa*, Lk.  
*Koeleria*, Lk.  
*Collinaria*, Ehrh.  
*Ægialitis*, Trin.  
*Ægialina*, Schult.  
*Lophochloa*, Rehb.  
*Schismus*, Palis.  
*Hemisacris*, Steud.  
*Wangenheimia*, Monch.  
*Dactylis*, L.  
*Lasiachloa*, Kunth.  
*Urochloa*, Nees.  
*Cynosurus*, L.  
*Chrysurus*, Palis.  
*Lamarcia*, Monch.  
*Pterium*, Desv.  
*Ectrosia*, R. Br.  
*Lophatherum*, Brongn.  
*Elytrophorus*, Palis.  
*Echinolysium*, Trin.  
*Plagiolytrum*, Nees.  
*Festuca*, Linn.  
*Sclerochloa*, Palis.  
*Sphenopus*, Trin.  
*Catapodium*, Lk.  
*Brachypodium*, Palis.  
*Vulpia*, Gmel.  
*Mygalurus*, Lk.  
*Schedonorus*, Palis.  
*Amphibromus*, Nees.  
*Bromus*, Linn.  
*Ceratichloa*, Palis.  
*Libertia*, Lej.  
*Mitchellia*, Dumort.  
*Orthocladia*, Palis.  
*Niola*, Linn.  
*Chasmanthium*, Lk.  
*Trisiola*, Raf.  
*Diarrhena*, Palis.  
*Diarrina*, Raf.  
*Uruensis*, Zea.  
*Corycarpus*, Zea.

\*\**Bambusidæ.*

*Arundinaria*, Rich.

*Miegia*, Pers.  
*Ludolfia*, Willd.  
*Triglossum*, Fisch.  
*Macronax*, Rafin.  
*Arthrostyloidium*, Ruppr.  
*Phyllostachys*, Sieb.  
*Streptocyna*, Palis.  
*Chusquea*, Kunth.  
*Rottbergia*, Raddi.  
*Platonia*, Kunth.  
*Dendragrostis*, Nees.  
*Merostachys*, Spreng.  
*Guadua*, Kunth.  
*Nastus*, Juss.  
*Stemmatospermum*, Pal.  
*Schizostachyum*, Nees.  
*Bambusa*, Schreb.  
*Arundarbor*, Bauh.  
*Deodrocalamus*, Nees.  
*Beesha*, Rheed.  
*Melocanna*, Rop.  
*Streptochaeta*, Nees.  
*Lepideilema*, Trin.

XI.—*Hordeæ.*

*Lolium*, Linn.  
*Crapalia*, Schrank.  
*Triticum*, Linn.  
*Spelta*, Endl.  
*Agropyrum*, Palis.  
*Trachymia*, Lk.  
*Secale*, Linn.  
*Elymus*, Linn.  
*Psammochloa*, Endl.  
*Cuviera*, Kœl.  
 ? *Sitanion*, Raf.  
*Gymnostichum*, Schreb.  
*Asprella*, Humb.  
*Hystrix*, Möench.  
*Hordeum*, Linn.  
*Zoeriton*, Palis.  
*Critesium*, Rafin.  
*Ægilops*, L.  
*Polyantheris*, Nees.  
*Pariana*, Aubl.

XII.—*Rottboellææ.*

*Nardus*, Linn.  
*Psilurus*, Trin.  
*Asprella*, Host.  
*Monerma*, Palis.  
*Lepturus*, R. Br.  
*Myurus*, Endl.  
*Micurus*, Endl.  
*Monerma*, Palis.  
*Syurus*, Endl.  
*Pholiurus*, Trin.  
*Oropetium*, Trin.  
*Onhiurus*, Gærtn.  
*Hemarthria*, R. Br.  
*Lodicularia*, Palis.  
*Vossia*, Wall. et Griff.  
*Mnesithea*, Kunth.  
*Thyridostachyum*, Nees.  
*Rottboella*, R. Br.  
*Hemipus*, Endl.  
*Stegiosa*, Lour.  
 ? *Cymbachne*, Retz.  
*Celorbachis*, Brongn.  
*Ratzburgia*, Kunth.  
*Aikinia*, Wall.  
*Xerochloa*, R. Br.  
*Tripsacum*, Linn.  
*Manisuris*, Linn.  
*Peltophorus*, Desv.

XIII. *Andropogoneæ.*

*Perotis*, Ait.

*Xystidium*, Trin.  
*Leptothrium*, Kunth.  
*Zoysia*, Willd.  
*Epiphytis*, Trin.  
*Matrella*, Pers.  
*Osterdamia*, Neck.  
*Dimeria*, R. Br.  
*Haplachne*, Presl.  
*Arthraxon*, Palis.  
*Pleurorhitis*, Trin.  
*Lucæa*, Kunth.  
*Eriochrysis*, Palis.  
*Plazerium*, Willd.  
*Saccharum*, Linn.  
*Phragmites*, Adans.  
*Saccharophorum*, Neck.  
*Tricholana*, Schrad.  
*Eriopogon*, Endl.  
*Imperata*, Cyrill.  
*Pogonatherum*, Palis.  
*Homoclitis*, Trin.  
*Erianthus*, Rich.  
*Ripidium*, Trin.  
 ? *Microstegium*, Nees.  
*Eulalia*, Kunth.  
*Leptatherum*, Nees.  
*Apocypis*, Nees.  
*Elionurus*, Kunth.  
*Anthistira*, Linn.  
*Themeda*, Forsk.  
*Perobachne*, Presl.  
*Androscopia*, Brongn.  
*Dictomis*, Kunth.  
*Apluda*, Linn.  
*Dictomis*, Palis.  
*Batratherum*, Nees.  
*Hologamium*, Nees.  
*Lepeocercis*, Trin.  
*Anatherum*, Palis.  
*Cymbopogon*, Spr.  
*Hypogynium*, Nees.  
*Agonium*, Nees.  
*Trachypogon*, Nees.  
*Schizachyrium*, Nees.  
*Pithecurus*, Willd.  
*Sorghum*, Pers.  
*Blumenbachia*, Kol.  
*Andropogon*, Linn.  
*Pollinia*, Spr.  
*Chrysopogon*, Trin.  
 ? *Rhaphis*, Loureir.  
*Centrophorum*, Trin.  
*Heteropogon*, Pers.  
*Ischæum*, Linn.  
*Schima*, Forsk.  
*Meoschium*, Palis.  
*Colladoa*, Cav.  
*Spodiopogon*, Trin.  
*Arundinella*, Raddi.  
*Goldbachia*, Trin.  
*Riedelia*, Trin.  
*Thysanachne*, Presl.  
*Pogonopsis*, Presl.  
*Thelepogon*, Roth.  
*Arthropogon*, Nees.  
*Zeugites*, P. Br.  
*Alloteropsis*, Presl.  
*Blittia*, Fries.

## Doubtful Genera.

*Pterium*, Desv.  
*Rytachne*, Desv.  
*Xenochloa*, Liechtenst.  
*Caryochloa*, Spr.  
*Heterelytron*, Jumph.  
*Aristaria*, Jumph.

NUMBERS. GEN. 291. Sp. 3800 ?

*Bryaceæ* ?

POSITION.—*Restiaceæ.*—*GRAMINACEÆ.*—*Cyperaceæ.*

*Palmaceæ.*



Muhl has endeavoured to show that Brown's view of the theoretical nature of the palea is untenable (*Ist. Zeitungs*, 1846, Jan. 17, and *Ann. Bot. Soc. N.Y.* 1848). He supposes the inferior palea not to form one third, a little displaced, of a symmetrical verticil, but to be a bud from whose axis the floral axis takes its rise. What he regards as proof of the correctness of this view is found in the viviparous state of *Poa alpina*, thus described:—"In the viviparous spikes of the *Poa alpina*, I have found the two calyptrae valves always perfectly normal, and only the palea deformed; the deviation from the normal structure is generally less in the most inferior flower than in the succeeding one, so that frequently the lowest is still perfectly normal, or approaches more to the normal structure than the flower situated higher up. The axis of the spicula exhibits the least variations. It is, as far as it bears aborted flowers, more or less thickened, full of sap, presents an unobscured growth upwards, and frequently small rootlets shoot out from its inferior internodes. In short, it has assumed the characters of an axis of vegetation, and perfectly resembles with its base a small culm of grass; while its inferior portion, which bears the calyptrae valves and forms the petiole of the spicula, is of the same small diameter as is the normal spicula, and, like the fruit-bearing spicula, dries up after the flowering season, while it admits of the falling off and independent vegetation of the upper deformed portion."

"In the monstrous flowers the inferior palea presents an increased width, and a more or less perfect metamorphosis into the form of a vegetative leaf. Generally, and especially upwards from the second flower, this metamorphosed inferior leaf provided with sheath, ligula, and lamina, is perfect; while even when the lowest of flowers is partially abnormal, its inferior palea frequently forms an intermediate stage between the normal form and that of a vegetative leaf. The latter ones are naturally best suited for allowing us to obtain an insight into the manner in which the metamorphosis of the palea into the vegetative leaf takes place. It is seen by the comparison of several such intermediate stages that the normal palea does not solely correspond, as we might at first be inclined to admit, to the sheath of the vegetative leaf, and that the metamorphosis of the palea into a leaf does not consist in a building forth of the lamina from the apex of the palea, but that a separation of the various parts of the palea, which are intimately fused together, takes place, and a development of them one from the other results. The normal palea possesses five nerves, of which the central one extends to the apex of the palea, while the lateral nerves are lost within the transparent scarious membrane. On its metamorphosis into a leaf the palea becomes elongated, its inferior portion surrounds the superiorly situated portion of the spicula in the form of a vagina, while its upper portion bends more or less upwards, and becomes changed into the lamina of the leaf. In those palea in which this metamorphosis is merely indicated, the palea still retains nearly its proper form, and the reddish colour which is diffused over the normal palea, and it is only its base which has become thicker, of a greenish colour, uncinately and recurved apically; a separation into vagina, ligula, and lamina is not yet indicated. When the metamorphosis has advanced further, the whole palea is lengthened considerably, its upper portion has become thicker, green, and leaf-like, while the lower portion has retained its more delicate texture, transparency, and likewise frequently the reddish colouring; the nerves, which are still present to the number of five, have assumed a more parallel position in consequence of the elongation of the leaf, and become confined towards the uncinately-curved apex of the latter. The margin is serrate, as in the normal palea. The separation into the various parts of the vegetative leaf now begins, and is terminated by the development of the ligula and the transverse expansion between the upper green and the lower brighter-coloured parts of the palea."

The singular monstrosity of *Hordeum collette*, called by Royle *B. anatum*, and by this country Nepal Barley, seems to offer some corroboration of Muhl's theory. Prof. Henslow has shown (*Hooker's Journal of Botany*, I. 304), that the inferior palea occasionally forms an inverted flower bud upon its midrib, a circumstance more likely to take place on an axis of inflorescence than on a leaf; this flower and ray structure may be found even more perfect than is shown in any of Henslow's figures. In a drawing made by myself many years since, I find the structure of the advanced flower-bud represented so complete as even to present well defined synergous scales.

It is not improbable that the midrib of all inferior palea may be so organically in nature from the palea itself, however much it may be adherent, as seems to be indicated by the strong tendency of the awn to separate from the palea itself, as an independent organ, the minimum of which we find in *Hordeum*, and the maximum in such plants as *Gymnathrix* or *Calamagrostis*. It may even be, as Brown and Henslow have suggested, that to all the ribs of the inferior glumes are attached floriferous axes? If so, Brown's theory will not be affected, we shall only have to add to it what concerns the supposed floriferous axes.



The value of some of the generic distinctions upon which botanists have hitherto relied is seriously disturbed by the curious discovery made by M. Esprit Fabre that *Ægilops* is merely the wild form of *Triticum*, that is to say, of cultivated Wheat.

The supposed poisonous qualities of certain Grasses has become more doubtful than ever. It is certain that *Bromus catharticus* is a nonentity, Feuillée's figure, on which this species has been founded, being made up of *Br. secalinus* and some purgative Iridaceous rhizome (*Medic. and Econom. Bot. p. 27*). And the noxious qualities of Darnel or *Lolium temulentum* seem to rest upon no certain proof. That formidable list of mischief, belonging to its seeds, of which Haller says so much, resembles what might be expected of some ergotised Grass. At all events the properties of Darnel should be made the subject of renewed inquiry.

## ADDITIONAL GENERA.

<i>Padia</i> , Zollinger.	} near <i>Oryza</i> .	<i>Rægnieria</i> , C. Koch.
<i>Anomochloa</i> , A. Brongn.		<i>Serrafalcus</i> , Parl. next <i>Bromus</i> .
<i>Lasiolytrum</i> , Steud. near <i>Phalaris</i> .		<i>Aulonemia</i> , Goudot. } near <i>Bambusa</i> .
<i>Knappia</i> , Sm. = <i>Mibora</i> .		<i>Acroelytrum</i> , Steud. }
<i>Reana</i> , Brign. } near <i>Zea</i> .		<i>Castellia</i> , Trin.
<i>Beckera</i> , Fresen. }		<i>Lepidopyronia</i> , A. Rich.
<i>Psammaphila</i> , Fries. near <i>Ammophila</i> .		<i>Eremopyrum</i> , Ledeb. }
<i>Donacium</i> , Fries. near <i>Arundo</i> .		<i>Pycnopyrum</i> , C. Koch. } near <i>Triticum</i> .
<i>Gamelythrum</i> , N. v. E. }		<i>Heteranthelium</i> , Hochst.
<i>Wilhelmisia</i> , C. Koch. } near <i>Amphipogon</i> .		<i>Critho</i> , E. Meyer. }
<i>Otenopsis</i> , De Not. }		<i>Crithopsis</i> , Jaubert. } near <i>Elymus</i> .
<i>Schellingia</i> , Steud. }		<i>Didactylon</i> , Zoll. near <i>Oropetium</i> .
<i>Dineba</i> , Pal. = <i>Eutriana</i> .		<i>Monachysson</i> , Parl. }
<i>Antinoria</i> , Parl. near <i>Aira</i> .		<i>Alectoridia</i> , A. Rich. }
<i>Harpachne</i> , Hochst. near <i>Köleria</i> .		<i>Psilopogon</i> , Hochst. } near <i>Andropogon</i> .
<i>Nardurus</i> , Boiss.		<i>Myriachæta</i> , Zoll. }
<i>Anisantha</i> , C. Koch.		



## Oliv. ANN CYPERACEAE 8

Cypripedium, *Jour. Geol.*, 20. (1798) = Cypripedium, R. Brown, *Papers*, 24; (1816). — *Silene*, Nutt., *North Amer. Bot.*, 1: 224; *Jour. Geol.*, 116; Michx., 2: 116; *Journ. Voy. et de North West. ex Pl. boreal.*, 4.

DIAGNOSIS.—*Chlamyd. Emdonensis* is a whole length infection, it is considered serious, and is fatal in about 50 per cent of the cases.

Grass-like herbs, growing in tufts and never acquiring a shrubby condition. Stems are never hollow, and seldom have any partitions at their nodes; the nodes are frequently angular, and are sometimes enlarged at the base into corms or tubers.

leaves are narrow or taper, and, they wrap round the stem in the form of a sheath, never have that sheath with flowers or fruits, consisting of reduced solitary bracts, of which the lowermost are often empty, very rarely enclosing other opposite bracts at right angles with the first, and called glumes, or glumes. Stamens hypogynous, dentate, 1, 2, 3, 4, 5, 6, 7, 10, 12; anthers 1 or 2; their base, entire, 2-celled. Ovary 1-seeded, often surrounded by bracts called hypogynous scale; ovule erect, anatropous; style single, united, or bifid; stigma undivided, occasionally bifid. Nut coriaceous or bony. Albumen fleshy or mealy, of the same figure as the seed, embryo lenticular, undivided, enclosed within the base of the albumen; plumose-inconspicuous.

Sedges so nearly resemble grasses in appearance, that the one may be readily mistaken for the other by incurious persons; they are, however, essentially distinguished by many important points of structure. In the last place, their stems are usually angular, not round and cellular; there is no diaphragm at the articulations; their flowers are destitute of any other covering than that of a perianth.

ed them by a single bract, in the axil of which they grow, with the exception of *Carex*, *Uncinia*, and *Diplacrum*, in which 2 opposite glumes are added; and, finally, the seed has its embryo lying in the base of the albumen, within which its cotyledonar extremity is enclosed, and not on the outside, as in Grasses; a very important fact, which it is the more necessary to point out, since Brown describes it (*P. n.* 212) as being placed and placed on the outside of the albumen. The additional glumes above adverted to form what Linnean botanists call the nectary or aril! Brown mentions a case where these glumes, which he calls a capsular perianth, included stamens instead of a pistil. According to Tamarit's account of the

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Fig. 1X XVIII. a—*Scirpus laevis* s. l. A flower, normal, and with hypogynous bristles; b— a whole, and a section of it, showing the lenticular embryo.

Fig. 4.  $\text{NNIN} = 1$  (solid) or  $\text{NNIN} = 2$  (dashed) for  $\text{NNIN} = 1$  and  $\text{NNIN} = 2$ .



latter sometimes appear in different species of *Mariscus*. Sedges approach certain Restiads in the peculiar state of the flowers and in general habit. They are, however, clearly distinguished from that order by their seeds being erect not pendulous, and by their more complicated ovary, which is always formed by 2 or 3 carpellary leaves, although enclosing only one ovule, while Restiads have but one carpellary leaf to each ovule. The sheaths of the leaves of Restiads are slit, like those of Grasses. Sedges stand then in the same relation to Restiads as Buckwheats to Chenopods. The species are extremely difficult to determine, and the distinctive characters of the genera were unsatisfactory, until Professor Nees v. Esenbeck rearranged the Order in the place above quoted.

Found in marshes, ditches, and running streams, in meadows and on heaths, in groves and forests, on the blowing sands of the sea shore, on the tops of mountains, from the arctic to the antarctic circle, wherever Phænogamous vegetation can exist. Humboldt remarks, that in Lapland Sedges are equal to Grasses; but that thence, from the temperate zone to the equator, in the northern hemisphere, the proportion of Sedges to Grasses very much diminishes. As we approach the Line, the character of the order also changes: *Carex*, *Scirpus*, *Schœnus*, and their allies, cease to form the principal mass, the room of which is usurped by multitudes of species of *Cyperus*, by *Kyllinga*, *Mariscus*, and the like, genera comparatively unknown in northern regions, or at least not forming any marked feature in the vegetation. A few species are common to very different parts of the world, as *Scirpus triqueter*, *Eleocharis capitata*, and *Fuirena umbellata*, to New Holland and South America, and several *Scirpi* to Europe and the southern hemisphere.

While Grasses are celebrated for their nutritive qualities, and for the abundance of fecula and sugar they contain, Sedges are little less remarkable for the frequent absence of those principles: hence they are scarcely sought for by cattle. The roots of *Carex arenaria*, *disticha*, and *hirta*, have diaphoretic and demulcent properties, on which account they are called German Sarsaparilla. Those of *Cyperus* are succulent, and filled with a nutritive and agreeable mucilage. In *Cyperus longus* (the *κυπειρος* of Hippocrates) a bitter principle is superadded, which gives its roots a tonic and stomachic quality. The tubers of *Cyperus hexastachyus* or *rotundus* are said by General Hardwicke to be administered successfully in cases of cholera by Hindoo practitioners, who call the plant Mootha. Those of *C. pertenuis*, or Nagur-Mootha, are, when dried and pulverised, used by Indian ladies for scouring and perfuming their hair. The root of *Cyperus odoratus* has a warm aromatic taste, and is given in India, in infusion, as a stomachic. The root of *Scirpus lacustris* is astringent and diuretic, and was once official. *Remirea maritima*, a common plant in tropical America, is said to be powerfully diaphoretic and diuretic; and the same qualities are ascribed to *Kyllinga odorata* and *Hypoporum nutans*. The leaves of Cotton-grasses, *Eriophorum*, were once used in diarrhoea, and the spongy pith of the stem to destroy tape-worms. *Cyperus Iria* has a reputation in India as a useful medicine in suppression of the menses, and in colic. The root of *Kyllinga triceps* is employed in the East Indies in diabetes, and as a stomachic, for which its acridity combined with some aroma has recommended it. The root of *Scleria lithosperma* is supposed upon the Malabar coast to have antinephritic virtues. The tubers or corns of *Cyperus esculentus*, (the *μαλινόθαλλη* of Theophrastus), called by the French *Souchet* comestible or *Amande de terre*, are used as food in the south of Europe, and are employed in the preparation of orgeat; Dr. Royle adds, that when roasted they have been proposed as a substitute for coffee and cocoa. The Chinese cultivate several species for food, especially the *Pi-tsi* or *Scirpus tuberosus*, which Nees v. Esenbeck regards as a bulbous form of *Limnochloa plantaginea*. And Dr. Royle informs us (*Illustr.* p. 413), that the *Cyperus bulbosus* of Vahl (*C. jemenicus* L.), called *Sheelandiaresee* in Madras, and *Puri-drempha* by the Telingas, has tubers which when roasted or boiled taste like potatoes, and would be valuable for food if they were not so small. *Scirpus dubius* of Roxburgh, (the *Allikee* of the Telingas) is given on the same authority as having tubers, which the natives say are as good as yams.

The *Papyrus* of the banks of the Nile, *Papyrus antiquorum*, of which boats, paper, and ropes are made, is a plant of this family; it is said to be called *Babeer* in Syria, and is described by the Arabians (*Ar. c.* 543), by the name *Fafeer* and *Burdee*: the former evidently of the same origin as the Greek and Syrian names. A species of the genus *Papyrus* (*P. corymbosus*, N. ab E., *P. Pangorei* Arnott) is hardly of less use in India, being extensively employed for making the mats so much used there for covering the floors of rooms, and which are also so much esteemed in Europe. Dr. Ainslie says that a species, called *Rora* and *Toonghi*, which he refers to *C. textilis* of Thunberg, is employed in the peninsula for the same purpose. Some of the species of *Scirpus*, especially *S. lacustris*, are sometimes substituted for rushes in making baskets and chair bottoms, &c.; *Cyperus textilis* is employed in making ropes, and as the *Papyrus*



of Egypt was by the ancients. The species of *Lisophorus*, called *Cyperus* in England, from having their fruit clothed at the base with scaly or papery substance, of which paper and wicks of candle have been made, and pillars called by a species (i.e. *composita*, Wall., *cucurbitum*, nob.), *Hydrum* of the natives, of which the leaves, previous to the plant flowering, are in the Himalayas extremely useful in rope-making. *Cyperus immitatus* probably, with other species, helps much to sand and protect the banks of the Ganges from the rapidity of the stream and the force of the tides; as in Holland *Carex arenaria* is carefully planted on the dikes, where its far extending roots, by mutually interlacing with each other, fix the sand and give strength to the embankment." (*Key to Illustr.* p. 115.) *Cyperus Hydra*, called *Nag grass* in the West Indies, is said to be a pest there, overrunning the *Sagartia phanerophylla*, and rendering them barren.

## GENERAL

L. Carieser  
Carex, Mich.  
Tassara, Polis.  
Schubert, Monch.  
Schoen, Rahn.  
Fischer, Rahn.  
Fischer, Gray  
Hoffman, Fyfe.  
Hoffman, Fyfe.  
Schubert, Monch.

[illegible]11. — *Myrica*.

Eriophaea, Desv.  
 Eriophaea, Lamour.  
 Eriophaea, Kunth  
 Eriophaea, Schreb.  
 Eriophaea, Wulff.  
 Eriophaea, Willd.

*Symptotica*, Noos,  
proculus, R. By  
... ..  
... ..

III. - *Sclerom*  
*Diplazium*, *R. Br.*  
*Psychotria*, *R. Br.*  
*Scleria*, *L. M.*

[illegible][illegible]

IV.—Rhynchosporeae.

\* *Rhynchospora*.  
Morisia, N. ex.  
Mitrospora, N. ex.  
Rhynchospora, N. ex.  
Rhynchospora, P. ex.  
Calyptrostylis, N. ex.  
Euphryodrychium, N. ex.

V.—Cladom.  
Cladium, *P. Ind.*  
Cladonia, *R. B.*  
Cladonia, *Gaul.*  
Cladonia, *Schrad.*  
Cladonia, *Presl*

*Epinephelus* var. *Procl.*  
*Oreochromis*, *P. aq.*  
*Oreochromis*, *R. Br.*  
*Epinephelus*, *R. Br.*

VI. - Chrysanthemum  
Chrysanthemum, *Leucanthemum*,  
Pandanophyllum, *Hemipandanus*,  
*Leptocarpus*, *Ruellia*,  
*Chrysanthemum*, *R. Br.*  
*Chrysanthemum*, *R. Br.*

VII.—Hypolytræ.  
Hypolytræ, N. S.  
Lycopodium, N. S.  
Hypolytræ, R. Br.  
Hypolytræ, L.  
Phlyptis, R. Br.  
Hypolytræ, R. Br.  
R. Br.  
Hypolytræ, R. Br.  
Hypolytræ, R. Br.

VIII - Fudrone  
• *M. maculipes*  
*M. maculipes*, Fuhl.  
*Thymus*, Fuhl.  
*Sedum*, Fuhl.  
*Asperula*, Fuhl.

Hemichlaena, *Leach*.  
Aclimata, *Leach*.  
Pleurachne, *Schrad.*

\*\*\* I. ...  
L... ..  
I... ..  
Vauthier, A. Rich.  
L... ..  
S... ..  
C... ..  
D... ..  
C... ..  
L... ..  
T... ..  
P... ..  
L... ..

[illegible][illegible]

Numbers—G18.112—50,000

POSITION.—Gramineae. *Amphibolus*.  
*Cyrtanthus*. *Hesperantha*.  
*Pennisetum*.

## ADDITIONAL COMMENTS

Hydrous, 27° near Rymkowskie  
Aschens, 20° near Aschens  
Einsporen, 16° near Einsporen  
Garten, 15° near Opatowitz

Miscellaneous, New York Division  
 (continued) 1. (cont.) (cont.)  
 (continued) 2. (cont.) (cont.)  
 (continued) 3. (cont.) (cont.)



## ORDER XXXI. DESLAUXIACEÆ.—BRISTLEWORTS.

Deslauxiæ, *Nixus Plantarum*, p. 23. (1833), a § of Restiaceæ; *Bartl. Ord. Nat.* p. 36; *Martius Conspiculus*, No. 38.—Centrolepideæ, *Deslaux in Ann. des Sc.* 13. 36. (1828); *Endl. Gen.* xlv.; *Meisner, Gen.* p. 409; *Kunth. Enum.* 3. 487.

DIAGNOSIS.—*Glumal Endogens*, with several ovaries (sometimes consolidated), a pendulous ovule, 1-2-stamens, 1-celled anthers, and terminal embryo.

Little tufted herbs, resembling small Scirpi. Leaves setaceous, sheathing at the base. Scapes filiform, undivided, naked. Flowers enclosed in a terminal spathe. Glumes one,

in front, or two somewhat opposite each other. Paleæ 0, or one or two tender scales parallel with the glumes. Stamen 1, very rarely 2; anther simple. Ovaries from 1 to 18 attached to a common axis, distinct or partially united, 1-celled, with a single stigma to each; ovules solitary, orthotropal. Fruit as many 1-seeded utricles, opening longitudinally; seed pendulous; embryo lenticular, placed within the extremity most remote from the hilum.

The main distinction of this Order consists in the ovaries, which are variable in number, and usually distinct from each other round a common axis, in the manner of a Ranunculus. Occasionally they are partially united; in all cases they change to little one-seeded utricles. The stamen, which is usually solitary, has a second added in the genus *Gaimardia*, which does not seem to be otherwise different. *Aphelia* has only one carpel, and this is regarded by *Endlicher* as a near approach to Sedges; but it is really very different, for the single ovary of that order is evidently made up of from 2 to 3 carpels enclosing a single ovule; while in *Aphelia*, as in all the Order of Bristleworts, the ovary consists of but a single carpel.

All inhabit the South Sea Islands; and nearly all New Holland.

They are of no known use.



Fig. LXXX.

*Aphelia*, R. Br.  
*Alepyrum*, R. Br.

GENERA.  
*Centrolepis*, Labill.  
*Deslauxia*, R. Br.

*Gaimardia*, Gaudich.

NUMBERS. GEN. 4. Sp. 15. (Kunth.)

POSITION. Restiaceæ.—DESLAUXIACEÆ.—Eriocaulaceæ.

Fig. LXXX.—*Centrolepis fascicularis* 1. A head of flowers; 2. a single flower separated; 3. an ovary with the style cut off—*Endlicher*







## ORDER XXXIII. ERIOCAULACEÆ.—PIPEWORTS.

Eriocaulonæ, *L. C. Richard in H. B. K. Nov. Gen. et Sp. Pl.* 1. 251. (1815); *Desvaux in Ann. Sc.* 13. 36.; *Martius in Act. Acad. Coss. Nat. cur.* 17.; *Endl. Gen.* xlvii.; *Meisner. gen.* p. 407; *Eriocaulonæ*, *Kunth. enum.* 3. 493.; *Act. Acad. Wissench. Berlin*, Febr. 1841.

DIAGNOSIS.—*Glumal Endogens*, with a 2-3-celled ovary, a pendulous ovule, 2-celled anthers, a terminal embryo, and a 3-lobed cup within the glumes.

Perennial marsh-plants, with linear cellular spongy leaves sheathing at the base.

Flowers capitate, bracteate, very minute, ♂ ♀. Glumes two, unilateral, or 3. A membranous tube, with 2 or 3 teeth or lobes, surrounds the ovary. Ovary superior 3- or 2-celled; ovules solitary, orthotropical; style very short; stigmas as numerous as the cells of the ovary. Dehiscence of the capsule loculicidal. Seeds solitary, pendulous, coated with wings or rows of hairs. Embryo more or less lenticular, lying upon the albumen at the end of the seed most remote from the hilum.

This order is usually combined with Restiaceæ (or Cord-leafs) from which, in a memoir in the 17th vol. of the *Nova Acta*, Von Martius separates it on the following grounds. Restiaceæ: Flowers in spikes. Calyx glumaceous

▽. Stamens in a single row, 1-3, opposite the petals; anthers generally 1-celled. Seeds with out rows of hairs. Eriocaulaceæ: Flowers in heads, unisexual. Calyx sepaloideous △. Stamens 3, 6, 2, 4; if in two rows, with the inner row most developed; anthers 2-celled. Seeds solitary, with rows of hairs. The most important distinctions seem to consist in the presence among the Pipeworts of a membranous tube, which may be regarded as the most distinct approach, in the Glumal Alliance, to the corolla of the petaloid series, and in the anthers being 2-celled, not 1-celled; a further indication of a higher order of development. Xyrids, with a perfect corolla, may be regarded as the link which connects these plants with some of the more perfect orders of Endogens.

Many remarkable species are figured by Bongard in *Memoirs of the Imperial Academy of St. Petersburg*, 6th series, 1. p. 601., &c.

A large number of species is collected under this head; all of which are amphibious or aquatic. According to Endlicher, two-thirds

are found in the tropics of America, and half the remainder in the north of New Holland. A few occur in North America, and one is found in Great Britain, in the isle of Skye.

Eriocaulon setaceum, boiled in oil, is said to be a popular remedy for the itch in the East Indies.

## GENERA.

*Eriocaulon*, *Kth.*  
*Eriocaulon*, *L.*  
*Dryopteris*, *Fl. flum.*  
*Natmythia*, *Huds.*

*Randia*, *Petiv.*  
*Sphaerocloa*, *Palis.*  
*Leucocephala*, *Roxb.*  
*Paepalanthus*, *Mart.*

*Tonina*, *Aubl.*  
*Hyphydra*, *Schreb.*  
*Philodice*, *Mart.*

*Cladocaulon*, *Gardn.*  
*Stephanophyllum*, *Guill.*  
? *Symphachne*, *Palisot.*

NUMBERS. GEN. 9. Sp. 200 (Kunth).

*Juncaceæ.*

POSITION.—Restiaceæ.—ERIOCAULACEÆ.—

*Xyridaceæ.*

Fig. LXXXII.—*Tonina fluviatilis*. 1. ♂ flower; 2. centre of do.; 3 ♀ an ♂ flowers; 4. section of ripe fruit; 5. seed; 6. section of do.—*Martius*.



## ALLIANCE VIII. ARALLIS.--THE ARAL ALLIANCE.

DIAGNOSIS. *Unicausal petaloid or united floral endogens, with a simple naked ovary, and an embryo in the axis of nearly or perfectly globose seeds.*

It is here that we find the lowest structure known among flowering plants. Lemnæ, the Lemnæd order, has a lenticular frond, in a cleft of whose edge lurk a couple of flowers, one ♂ and the other ♀ enclosed in a membranous bag. In *Pistia*, of the same Lemnæd order, the leaves are separated from the stem, the flowers are none separated, and the ♀ has the beginning of a calyx. In *Ambrosinia*, also associated with Lemnæ, a complete bearded spathe is formed, and the ♂ is of a more complicated structure. From these plants we pass into the Arads, with naked flowers growing in dense spikes or spadices, and they lead, on the one hand to the palm-like Screw-Palms, and on the other to the sedgy Typhads, by means of which, especially the former, a communication is effected with the princely Palms. By another transition, into the *Orentiaceæ* of Lemnæ, phorolite hypogynous Endogens, a passage is formed into Lilyworts on the one hand and Peppers on the other. In fact, as I stated long since, the Aral Alliance, and more especially the Araceæ order, is the centre of a large system whose rays pervade the remote parts of the vegetable kingdom. Through Lemnæ this Alliance passes into the Hydral by way of the Naiads. The *Syadicifloræ* of modern botanists, or *Syadicæ* of Blume (*Rumphia* 2. 74) are nearly the same plants, except that Meisner includes Palms among them, to which there seems some objection.

## NATURAL ORDERS OF ARALS.

<i>Flowers 2 or 3, of which one only is ♂. Spadix 0. Ovary one-celled.</i>	Pistia.
<i>Ovules erect. Embryo slit</i>	
<i>Flowers 00, on a naked spadix. Calyx only at base. Anthers with long filaments. Ovary 2-celled, pendulous. Seed indurated in the pericarp. Embryo slit</i>	Typha.
<i>Flowers 00, naked, on a solitary spathe, covered by a small bearded spathe. Anthers sessile. Seed large. Embryo slit, with</i>	
<i>Flowers 00, naked or nearly, on a spathe, covered by a long spathe, bearded at the base. Seeds large. Embryo sessile, sessile</i>	Araceæ.



## ORDER XXXIV. PISTIACEÆ.—LEMNADS, OR DUCKWEEDS.

PISTIACEÆ, *Rich. in Humb. et Bonpl. N. G. et Sp.* 1. 81. (1815); *Lindl. in Hooker's Fl. Scot.* 2. 191. (1821); *Synops.* 251. (1829); *Endl. Gen.* p. 233; *Meisner*, p. 363; *Kunth enum.* 3. 7; *Blume, Rumphia* 2. 76.—LEMNACEÆ, *DC. and Duby*, 532. (1828); *Endl. Gen.* p. 232; *Meisner*, p. 363; *Kunth. enum.* 3. 2. *Schleiden in Linnæa*, xiii. 384; *Hoffman in Tydschr. v. nat. Gesch. Leyden* (1838).

DIAGNOSIS.—*Aral Endogens* with 2 or 3 flowers, of which one only is ♀, no spadix, a one-celled ovary, erect ovules, and a slit embryo.

Floating or land plants, with very cellular, lenticular, or lobed fronds or leaves, some of them wholly destitute of spiral vessels, except perhaps in the pistil. Flowers appearing from the margin of the fronds, 2 or 3, naked, enclosed in a spathe, but without a spadix. ♂ Stamens definite, often monadelphous (pollen globose, muricated, with a single aperture in *Lemna Schleiden*): ♀ Ovary 1-celled, with one or more erect ovules; style short; stigma simple; ovules anatropal, hemianatropal, or atropal. Fruit membranous or capsular, not opening, 1- or more-seeded. Seeds with a fungous testa, and a thickened indurated foramen; embryo either in the axis of fleshy albumen, and having a lateral cleft for the emission of the plumule, or at the apex of the nucleus, covered in by a hardened endostome.

The common Duckweed (*Lemna*) may be regarded as being the most simple of all Phænogamous plants. Its stem and leaves are fused into a minute lenticular frond, which pullulates by openings in its sides; its roots are simple fibres, tipped by a calyptra, which *Schleiden* regards as a peculiar organ, and its flowers are two in number, one male and the other female, lying concealed in a slit of the frond; they have neither calyx nor corolla, but are enclosed in a delicate membranous bag. *Lemna* is indeed but one remove from a *Crystalwort* (*Riccia*, p. 57); species of which have even been mistaken for *Lemnæ* by some authors, according to *Schleiden*.

All the true *Lemnæ* are almost entirely destitute of spiral vessels, which the same author found abundantly in the old *L. polyrrhiza*, now called *Spirodela*. A *Lemna* indeed may be said to consist of a small plate of cellular tissue, and a couple or three flowers. There is however in the fresh water of tropical countries a very common floating plant, called *Pistia*, which may be regarded as a *Lemna* with the leaves and stem separated, and the flowers more highly developed; there being a distinct spathe for the inflorescence, and a kind of cup-like calyx to the male flower. And then again the Mediterranean gives birth to *Ambrosinia*, a little land plant, with leaves of an ordinary kind, and a small spathe inclosing a couple of flowers, of which the uppermost has many monadelphous stamens, perfectly destitute of a calyx, and an ovary which is like that of *Pistia*. If we disregard the simplicity of this structure, and consider the organisation as if it belonged to plants of a more highly developed character, it will be found that these are really nothing but *Arads*, the spadix of which is reduced to two or three flowers of different sexes. But while the accuracy of this view of the nature of the Duckweed order is generally acknowledged, it must be borne in mind that this very reduction of parts is inconsistent with the notion of *Arads*, properly so called; and hence the necessity of constituting a particular order. I find from an examination of seeds of *Pistia*, most kindly procured from India for me by Dr. Wallich, that the embryo is a minute body lying within the apex of the albumen; in *Lemna* it occupies the axis; in both there is a fungous testa, with a remarkable induration of the foramen of the secundine. The embryo of *Pistia* is very minute, and, as far as I can see, solid; but *Horkel* says it is slit, and in *Lemna* there is certainly a cleft on one side for the emission of the plumule, just as in *Arads*. Most

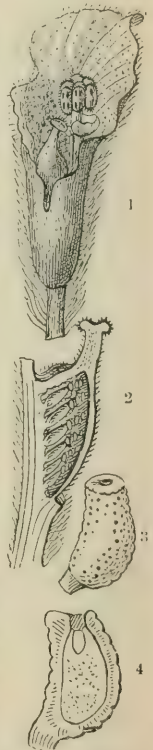


Fig. LXXXIII.

Fig. LXXXIII.—*Pistia Stratiotes*. 1. A spathe with its 2 flowers; 2. a section of a seed-vessel; 3. a seed; 4. the same cut perpendicularly.



modern systematists regard Pistaceae and Lemnaceae as distinct submersed plants from which I separate them on account of their want of spines, Ambrosia connecting them with the curious genus *Cryptocoryne*. By some recent bot. Auth. Ambrosia Dunal and Endlicher regard Lemnaceae as exaluminous.

*Lemna* inhabits the ditches of the cooler parts of the world. Pistia the warmer; Ambrosia the basin of the Mediterranean.

*Pistia Stratiotes* grows in water-tanks in Jamaica, where, according to Brown, it is acrid, and in hot dry weather impregnates the water with its particles to such a degree as to give rise to the bloody flux. A decoction of the same plant is considered by the Hindoostanes as cooling and demulcent, and they prescribe it in cases of dysentery. The leaves are also made into a poultice for hemorrhoids. See also *Marston, Mat. Med. Bras.* 97.

GENERA.

*Lemna*, L.  
W. Alth., Hook.  
*Isotriaena*, Rehb.

*Pistia*, L.  
*Stratiotes*, Schreb.  
*Sparganium*, Schreb.  
Zost. Four

*Ambrosia*, L.  
C. Presl, Four

NUMBERS. GEN. 3. Sp. 20.

*Pistia*, L.

POSITION. PISTIACEAE. — ARCEUTH.

*Najas*, L.

The leaves of *Pistia* have no stomates, but are furnished instead with jointed hairs. — *Griffith, Not.* III. 124, 211; which consult for numerous details and special names, as to the import of organs.

ADDITIONAL GENERA.

*Griffithia*, Griffith, *Not.* III. 124, 211.  
*Monocotyle*, Kütz. *Not.* III. 124, 211.  
*Lemnaceae*, Kütz. *Not.* III. 124, 211.



## ORDER XXXV. TYPHACEÆ.—TYPHADS OR BULRUSHES.

*Typhac.* Juss. Gen. 25. (1789).—Aroideæ, § 3. *R. Brown Prodr.* 338. (1810).—Typhineæ, *Agardh Aph.* 139. (1823). *Kunth. enum.* 3. 88. (1841).—Typhaceæ, *DC. and Duby.* 482. (1828); *Richard in Arch. de Bot.* vol. 1. p. 193; *Endlich. gen.* lxxiii.; *Meisn. p.* 360.—Typhoideæ and Sparganioideæ, *Link. Handb.* 1. 132. 133. (1829), as sections of Cyperaceæ. *Schneitzlein dissert.* 1845.

**DIAGNOSIS.**—*Aral Endogens*, with numerous flowers on a naked spadix, a scaly or hairy calyx, long filaments, a solitary pendulous ovule, a seed adherent to its pericarp, and slit embryo.

Herbaceous plants, growing in marshes or ditches. Stems without nodes. Leaves rigid, ensiform, with parallel veins. Flowers ♂ ♀, very closely arranged upon a spatheless spadix. Sepals = mere scales, 3 in number or more; sometimes a mere bundle of hairs. Petals wanting. ♂ : Stamens 3 or 6; anthers wedge-shaped, attached by their base to long filaments, which are sometimes monadelphous. ♀ : Ovary single, superior, 1-celled; ovule solitary, pendulous, anatropal; style short; stigmas simple, linear. Fruit dry, not opening, 1-celled, 1-seeded, made angular by mutual pressure. Seed pendulous, with a membranous skin adhering to the pericarp. Embryo in the centre of mealy albumen, straight, taper, with a cleft in one side, in which the plumule lies; radicle next the hilum.

Jussieu, following Adanson, distinguishes these from Arads, with which Brown re-unites them, retaining them, however, in a separate section. They are generally regarded as a distinct tribe by most writers, and seem sufficiently characterised by their calyx being 3-sepaled and half-glumaceous, or a mere bundle of long hairs, by their lax filaments, wedged anthers, solitary pendulous ovules, and peculiar habit. *Agardh* refers Bulrushes to glumaceous Monocotyledons, on account of the analogy between the calyx of *Typha* and the hypogynous hairs of *Eriophorum*, a genus of Sedges; and a similar view of their affinity has been taken by *Link*; and in fact they do appear to constitute a direct transition from the glumaceous to petaloid Endogens, for although their floral envelopes are mere scales, yet they are arranged in regular whorls. In habit they are hardly distinguishable from Sedges. In another point of view they may be looked upon as diminutive species of Screw-pines (*Pandaneæ*), and *Kunth* so considered them formerly: but their simple fruit, solitary ovules, and the slit in the side of their embryo, offer sufficient marks of distinction.

Found commonly in the ditches and marshes of the northern parts of the world, but uncommon in tropical countries: one species occurs in St. Domingo, and another in New Holland. Two are described from equinoctial America.

They are of little known use. The powdered flowers have been used as an application to ulcers. The pollen of *Typha* is inflammable, like that of *Lycopodium*, and is used as a substitute for it. *De Candolle* remarks that it is probable the facility of collecting this pollen which is the real cause of its use, and that any other kind would do as well. The rhizomes of *Typha* abound in starch, are somewhat astringent and diuretic, and are employed in the east of Asia in dysentery, gonorrhœa, and the measles; they are also used as food. The pollen, mixed with water, forms a kind of bread in Scinde, Western Australia, and New Zealand.

## GENERA.

*Typha*, L.*Sparganium*, L.*Platanaria*, Gray.

NUMBERS, GEN. 2. Sp. 13. (Kunth.)

Acoraceæ.

POSITION.—TYPHACEÆ.—Pandaneæ.

Cyperaceæ.

FIG. LXXXIV.—1, *Typha latifolia*; 2, its fruit; 3, a section of the seed; 4, the embryo; 5, a stamen.  
—*Nees v. Esenbeck.*



## Gene XXXVI ARCT. L.—ALG.

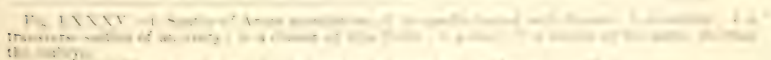
AMERICAN, from 1893-1894, in *Journal of the American Society of Naturalists*, 1: 74. First by mon.  
Mammals, p. 400; Birds, p. 411. *Marine in the Atlantic*, 1914, 1: 14. *Journal of the*  
1914, 1: 14. *Journal of the American Society of Naturalists*, 19: 15-16.

**Diagnosis.**—*And. fulvipes*, with numerous red-brown or yellow spots, seems to a large-headed beetle, dark rather, but with red and yellow stripes.

Herbaceous plants, frequently with a fleshy corm ; or shrubs ; stemless or arborescent, or climbing by means of aerial roots. Leaves sheathing at the base, sometimes in 2's, but, usually with branching veins ; sometimes compound ; often serrate. Stems generally enclosed in a spathe. Flowers 2's, whorled, arranged upon the surface of a spathe, within a spathe. 3's. Stamens 4-folio or 10-foliate, hypogynous, very short ; anthers 1-2- or many-celled, ovate, turned outwards. 2's, at the base of the spathe. Ovary free, 1-celled, very seldom 2- or many-celled, and many-seeded ; axile erect or perigynal, sessile, or attached to long cords, orthotropal, mesototropal, or occasionally anatropal ; stigma sessile. Fruit 2-celled. Seeds pulpy ; embryo in the axis of fleshy or woody albumen, straight, taper, with a cleft in one side, in which the plumule lies ; cotyledonous, usually next the hilum, occasionally at the opposite extremity. *E. Ind.* A. other specimens omitted.

The hooded spathe of the order of *Araceæ* affords a character not to be mistaken, and, connected with their delicious nectar, always gives them their most interesting appearance; but they are distinguished by their long mothers and young spathes; some fleshy, others solid, cartilaginous and increased fruit; and these, aided by their tendency to the simplest state in which flowering plants can exist. The whole of these Orders, taken together, are known by their general tendency to develop many flowers upon a spathe, by their want of floral envelopes, or by these parts but assuming the distinct forms of calyx and corolla, but existing only in the state of herbaceous scales. With the exception of some Ferns, they are all also adorned by their plumule lying within a coat of the embryo; a structure found in no other monophyletic plants, except Nodials, in which the embryo is otherwise widely different, and the hermaphrodite *Osmunda*, which are so much like *Araceæ* in all but the construction of their sexes.

Natives of all tropical countries. Abundantly, but of somewhat slender body. In





cold or temperate climates they are usually herbaceous, while in tropical countries they are often arborescent and of considerable size, clinging to trees by means of their aerial roots, which they protrude in abundance. In America, according to Humboldt (*Distr. Géogr.* 196), their principal station is on the submontane region, between 1200 and 3600 feet of elevation, where the climate is temperate and rains abundant.

An acrid principle generally pervades this Order, and exists in so high a degree in some of them as to render them dangerous poisons. The most remarkable is the Dumb Cane, or *Dieffenbachia Seguina*, a native of the West Indies and South America, growing to the height of a man: this plant has the property, when chewed, of swelling the tongue, and destroying the power of speech. Hooker relates an account of a gardener, who "incautiously bit a piece of the Dumb Cane, when his tongue swelled to such a degree that he could not move it; he became utterly incapable of speaking, and was confined to the house for some days in the most excruciating torments." The same excellent botanist adds, that it is said to impart an indelible stain to linen. P. Browne states, that its stalk is employed to bring sugar to a good grain when it is too viscid, and cannot be made to granulate properly by the application of lime alone; *Cryptocoryne ovata* is used for the same purpose. The leaves of *Colocasia esculenta* excite violent salivation and a burning sensation in the mouth, as I have myself experienced. Milk in which the acrid root of *Arum triphyllum* has been boiled has been known to cure consumption. DC. Notwithstanding this acidity, the flat under-ground corms, called roots, and the leaves of many Arads, are harmless, and even nutritive when roasted or boiled; as for instance, those of *Caladium bicolor*, pœcile and violaceum, *Colocasia esculenta*, *himalensis*, *antiquorum*, *mucronata*, and others, which, under the names of Cocoa root, Eddoes, and Yams, are common articles of food in hot countries. Nevertheless the juice of *Caladium bicolor* is cathartic and anthelmintic. Whole fields of *Colocasia macrorhiza* are cultivated in the South Sea Islands, under the name of Tara or Kopeh roots. The corms of the *Arum maculatum* are commonly eaten by the country people in the Isle of Portland; they are macerated, steeped, and the powder obtained from them is sent to London for sale under the name of Portland Sago. They are universally cultivated in India, and known there under the names of Kuchoo and Gaglee. *Arum nymphæifolium*, which Dr. Roxburgh considers only a variety of *C. antiquorum*, is but rarely cultivated in Bengal. *Arum indicum*, *Man-kuchoo* and *Man-guri* of the Bengalese, is a species much cultivated about the huts of the natives for its esculent stems and small pendulous tubers. *Arum campanulatum*, now *Amorphophallus*, Ol of the Bengalese, and which deserves to be called the Telinga Potato, is also much cultivated, especially in the Northern Circars, according to Dr. Roxburgh, where it is highly esteemed for the wholesomeness and nourishing quality of its roots. In the Himalayas, the species which is called *Colocasia himalensis* forms the principal portion of the food of the hill-people. Royle. (Medicinally, the root in its recent state is stimulant, diaphoretic, and expectorant.) A similar starchy substance is yielded by *Xanthosoma sagittifolia* (Chou caraib), *Peltandra virginica*, and the huge and hideous *Amorphophalli* of the Indian Archipelago. The spadixes of some species have a fetid putrid smell; others, such as *Arum cordifolium*, *italicum*, and *maculatum*, are found to disengage a sensible quantity of heat at the time when they are about to expand. The emanations from *Arum Dracunculus* are extremely inconvenient; when in flower they produce dizziness, head-ache, and vomiting. A writer in the *Annals of Chemistry* says that he was attacked with violent head-ache and sickness after gathering about 40 of the spadixes. *Amorphophallus orixensis* having exceedingly acrid roots, is, when fresh, applied in India by the natives in cataplasm to excite, or bring forward tumours. Dr.

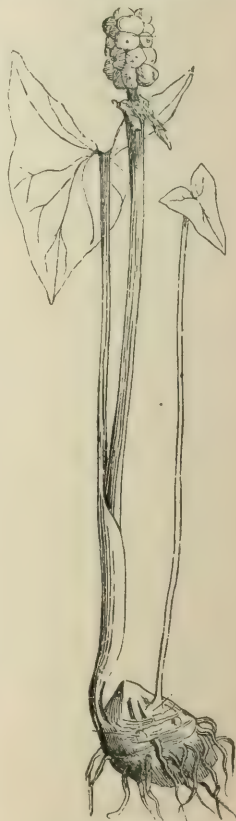


Fig. LXXXVIII.







## ORDER XXXVII. PANDANACEÆ—SCREW PINES.

Pandanaceæ, *R. Brown, Prodr.* 340. (1810); *De Cand. Propr. Méd.* 278. (1816); *Agardh Aph.* 133. (1822); *Gaudichaud in Ann. des Sc.* 3. 509. (1824); *Schott et Endlicher Meletemata*, p. 15. (1832). *Endl. gen.* lxxiv.; *Meisner*, p. 359; *Kunth Enum.* 3. 93; *Bennett in Horsfield, Pl. Jav.* 32; *Blume Rumphia*, 1. 155.—Cyclantheæ, *Poiteau in Mem. Mus.* 9. 34. (1822); *Schott et Endlicher, Meletemata*, p. 15. (1832); *Martius Conspectus*, No. 22. (1835).—Cyclanthaceæ, *ed. pr.*—Freyinetiæ, *Ad. Brongn. tableau xv.* (1843).

DIAGNOSIS.—*Aral Endogens*, with numerous naked or scaly flowers, arranged on a spadix covered by many spathes, stalked anthers, loose seeds, and a solid minute embryo.

Trees or bushes, sometimes sending down aerial roots, sometimes weak and decumbent. Leaves imbricated, in three rows, long, linear-lanceolate, amplexicaul, with their margins almost always spiny; or pinnated, or fan-shaped; the latter being true leaves, the former, perhaps, mere leaf-stalks. Floral leaves smaller, often coloured, and spathaceous.

Flowers ♂ ♀ or polygamous, naked, or furnished with a few scales, arranged on a wholly covered spadix. ♂: Stamens numerous. Filaments with single anthers; anthers 2-4-celled. ♀: ovaries usually collected in parcels, 1-celled; stigmas as many as the ovaries, sessile; ovules solitary, attached to the suture, or very numerous, and springing from as many parietal placente as there are styles, anatropal. Fruit either fibrous drupes, usually collected in parcels, each 1-seeded; or many-celled berries, with polyspermous cells. Albumen fleshy, with a minute embryo at the base next the hilum, not slit on one side.

Although this Order is certainly very distinct from Arads, it is by no means easy to define its limits. Blume says it is principally known by its numerous spathes to each spadix, and its narrow, sessile, 3-rowed leaves, spiny at the back and edge, (*Rumphia* 2. 155); but this applies only to Pandanæ proper, for the Cyclantheous division has the flabellate or pinnate foliage of Palms, and to all appearance establishes the connection between the Aral and Palmal Alliances.

The species of *Pandanus* and *Freycinetia* have the aspect of gigantic Bromeliads, bearing the flowers of a *Sparganium*. While there is no analogy with the former in structure beyond the general appearance of the foliage; the organisation of the fructification bears so near a resemblance to the latter as to have led to the combination of Screw-pines and Typhads by botanists of the first authority. But when we contrast the naked flowers, the compound highly-developed fruit, the spathaceous bracts, the entire embryo, and the arborescent habit of the for-

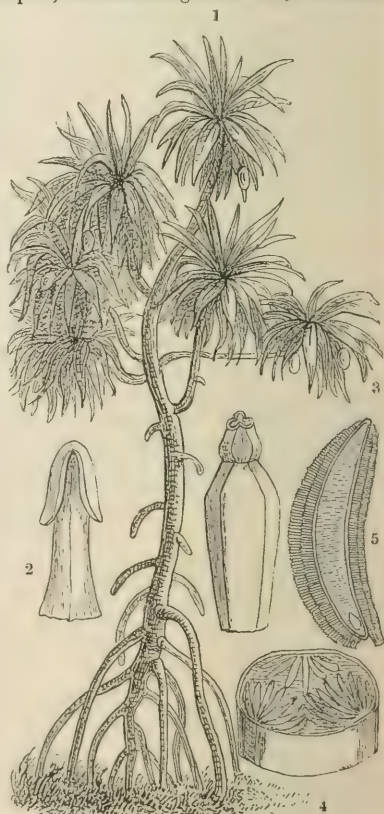


Fig. LXXXVIII.

Fig. LXXXVIII.—1. A *Pandanus*; 2. a stamen of *Freycinetia imbricata*; 3. an ovary of ditto; 4. the transverse section of the same; 5. a perpendicular section of its seed.—*Blume*.



mer, with the half glutinous flowers, the simple fruit, the want of spathaceous bracts, the slit embryo, and the herbaceous scaly leaflet of the latter, it is difficult to withhold our assent from the proposition to separate them. Brown remarks (*P. nat.* 311), that these have no affinity with Palms beyond their arborescent stems. But, on the contrary, Cyclantheæ, which, following Poiteau and others, I formerly adopted, have, with the structure of Pandanaceæ proper, the foliage of Palms, and are in reality a connecting link between the two Orders. At least, *Carludovica* evidently is so, as is shown by H. B. K.'s figure in the *Botanical Magazine*, t. 2351, and *Cyclanthus* seems to have its peculiarity beyond a curious spiral arrangement of its ♂ and ♀ flowers in alternate rows.

Mr. Bennett has pointed out an error made by Gaudichaud, who places the embryo at the apex of semitransparent albumen. He states, that it is certainly at the base, as indicated by Blume has shown in a beautiful figure of *Freycinetia imbricata*. Screw-pines are remarkable among arborescent monocotyledons for their constant tendency to branch, which is always effected in a dichotomous manner. Their leaves have also a uniform spiral arrangement round the axis, so as to give the stems a sort of corkscrew appearance, before the traces of the leaves are worn away. The Chandelier Tree of Guinea and St. Thomas's derives its name (*Paulanus Candelabrum*) from this peculiar tendency to branching. According to *P. nat.* (l. 223), *Nipa* ought to be referred here, and not to Palms, an opinion adopted by Kunth, but not by Endlicher. A figure of it was to be found at p. 133, in a sketch of the vegetation of Palms. The *Tagua* plant, or Vegetable ivory, referred hither by Endlicher and others, seems to be a true Palm. According to Mr. Bennett, the seeds of *Freycinetia* and *Paulanus* have such an abundance of rapides in their testa, that those crystals are conspicuous to the naked eye.

The Screw-pines are abundant in the Mascarene Islands, especially the Isle of France, where, under the name of *Vaqueois*, they are found covering the sandy plains. There they have peculiar means given them by nature to resist adverse situations in the shape of strong vertical roots, which are protruded from the stem, and descend towards the earth, bearing on their top a loose cup-like covering of cellular integument, which preserves their tender newly-formed abscesses from injury until they reach the soil, in which they quickly bury themselves, thus adding at the same time to the number of months by which food can be extracted from

the unwilling earth, and acting as stays to prevent the stems from being blown about by the wind. They are common in the Indian Archipelago, and in some tropical islands of the Old World, but are rare in America. *Hort. de Trin. trop.* 106. The *Freycinetias* are scrambling plants, often of considerable stature, found in the Indian Archipelago and adjacent islands. The *Cyclantheæ* are exclusively American, from Texas and Brazil.

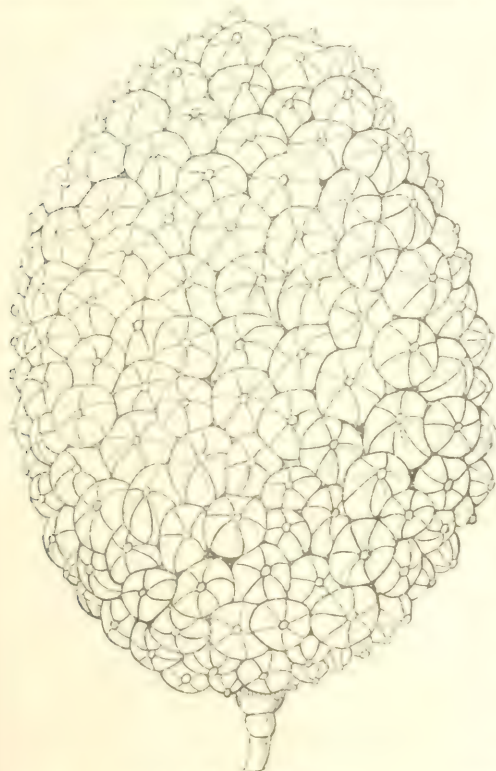


FIG. LXXXIX.







ALLIANCE IX. PALMALES.—THE PALM ALLIANCE.

DIAGNOSIS.—*Unicausal (or biscausal) Endogen, with perfect flowers, united perianthium, scaly spathe, and a cavity only partially below the edge of leaf or bract.*

At this point the vegetative force of Endogens acquires its maximum power, resulting for the most part in trees of gigantic stature, always forming wood, and commonly arriving at dimensions wholly unknown among other plants, as in the instance of some of the *Coccothrin Rotangs*, which Rumphius informs us are sometimes as much as 1000 or even 1000 feet long. (*Herbar. 2. 153*.) A writer in the *Linnæa*, (14. 263) asserts that Palms are nearer Aracs than to any other order of Endogens, and I think him so right that I should have followed Meisner in including Palms in the Aral alliance, if it had not been for their perfect floral envelopes, the uniformly indeterminate station of their embryo, and the tendency that exists among them to form ♂ flowers; which circumstances I rank them close upon Lilyworts, and seem to indicate a higher degree of organization than we find among the incomplete-flowered, constantly ♂ ♀ Aral plants.

The general opinion of Botanists seems to be in favour of regarding Palms as one natural order, an opinion to which it does not seem at present desirable to object. It may however be observed, that the scaly-fruited genera, called *Lepidocaryæ* by Martius, *Calameæ* by Kunth, and *Calaminæ* by Griffith, offer in that



1

FIG. XC.

circumstance, and also in most instances in their habit, a very considerable deviation from the condition of the other genera, and seem to indicate the existence of at least one natural order to be struck off the true Palms.



## ORDER XXXVIII. PALMACEÆ.—PALMS.

*Palmæ*, Juss. Gen. (1789); R. Brown, Prodr. 266. (1810); Von Martius Palm. Bras. (1824 to 1836); Id. Programma (1824); Barth. Ord. Nat. 63. (1830); Endl. gen. lxxv.; Royle Illustrations, p. 399; Blume Rumphia, vol. 2. passim; Kunth. enum. 3. 168; Meisner, p. 354. Griffith in Calcutta Journal of Natural History, vol. 2.—Phytelephantæ, Martius Conspectus, No. 21. (1835).

DIAGNOSIS.—*Unisexual (or bisexual) Endogens, with perfect flowers, seated on a branched scaly spadix, and a minute embryo lodged below the surface of horny or fleshy albumen.*

Trunk arborescent, simple, occasionally shrubby, sometimes branched, rough with the dilated half-sheathing bases of the leaves or their scars; in the Rotangs flagelliform, and extremely long; occasionally armed with stiff spines. Leaves clustered, terminal, usually very large, pinnate or flabelliform, plaited, with parallel simple veins; in some

cases eroded and wedge-shaped. Spadix scaly, terminal, often branched, enclosed in a 1- or many-valved spathe, which is often woody. Flowers small, supported by scaly bracts, ♂ ♀, or occasionally ♂. Sepals 3, colourless, fleshy or leathery, persistent. Petals 3, often larger, and sometimes deeply connate. Stamens inserted into the base of the perianth, usually definite in number, opposite the segments, to which they are equal in number, seldom 3; sometimes indefinite in number. Ovary free, usually composed of 3 carpels, completely united, or partially so; occasionally of 2 or 1 only. Ovules solitary, very rarely 2, erect, orthotropal, or anatropal in various degrees. Styles continuous with the carpels. Fruit drupaceous, or nut-like, or berried, often with a fibrous rind. Seed filling the cavity in which it grows, often reticulated. Albumen cartilaginous, often ruminant, frequently furnished with a central or ventral cavity; embryo lodged in a particular cavity of the albumen, usually at a distance from the hilum, dorsal and indicated by a little nipple, taper or pulley-shaped; plumule concealed, scarcely visible; the cotyledonar extremity becoming thickened in germination, and either filling up a pre-existing cavity, or one formed by the liquefaction of the albumen in the centre.



Fig. XCI.

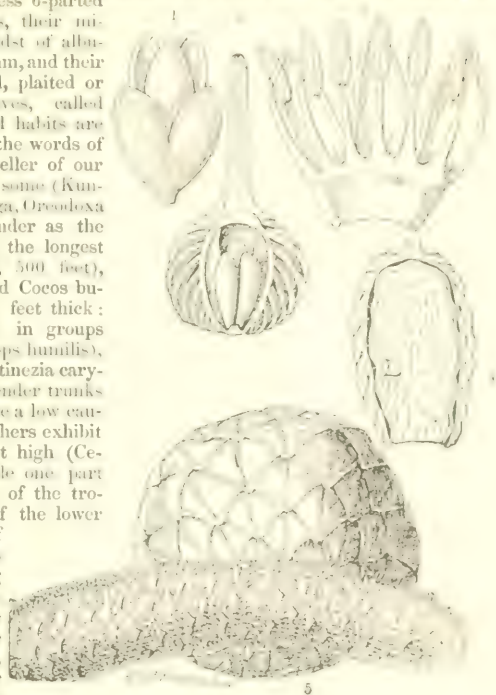
The race of plants to which the name of Palms has been assigned is, no doubt, the most interesting in the vegetable kingdom, if we consider the majestic aspect of their towering stems, crowned by a still more gigantic foliage; the character of grandeur which they impress upon the landscape of the countries they inhabit; their immense value to mankind, as affording food, and raiment, and numerous objects of economical importance; or, finally, the prodigious development of those organs by which their race is to be propagated. A single spathe of the Date contains about 12,000 male flowers; *Alfonsia amygdalina* has been computed to have 207,000 in a spathe, or 600,000 upon a

Fig. XCI.—1. Inflorescence of *Chamaerops humilis*, in its spathe; 2. a portion of the same, with the fruit ripening; 3. a male flower; 4. a female flower; 5. a ripe fruit; 6. a section of another variety, showing the seed; 7. a seed with a portion of the surface cut away, to display the embryo.



single individual ; while every bunch of the *Seje Palm* of the *Cronquist* has 1000 fruits. They are very uniform in the botanical characters by which they are distinguished, especially in their fleshy colourless 6-parted flowers, enclosed in spathes, their minute embryo lying in the midst of albumen and remote from the hilum, and their arborescent stems with rigid, plaited or pinnated, inarticulated leaves, called fronds ; but their aspect and habits are extremely various. To use the words of the most accomplished traveller of our own, or any age :—“ While some (*Kundia montana*, *Aiphanes Praga*, *Oreodoxa frigida*) have trunks as slender as the graceful reed, or longer than the longest cable, (*Calamus Rudentum*, 500 feet), others (*Jubæa spectabilis* and *Cocos butyracea*) are 3 and even 5 feet thick : while some grow collected in groups (*Mauritia flexuosa*, *Chamærops humilis*), others (*Oreodoxa regia*, *Martinezia caryotefolia*) singly dart their slender trunks into the air ; while some have a low caudex (*Attalea amygdalina*), others exhibit a towering stem 160-180 feet high (*Ceroxylon andicola*) ; and while one part flourishes in the low valleys of the tropics, or on the declivities of the lower mountains, to the elevation of 900 feet, another part consists of mountaineers bordering upon the limits of perpetual snow.” To which may be added, that while many have a cylindrical undivided stem, the *Doom Palm* of Upper Egypt, and an allied species, the *Hyphæne coriacea*, are remarkable for their dichotomous repeatedly-divided trunk. The *Calami*, or *Rotangs*, and the siliceous secretions of their leaves, indicate an affinity with Grasses, which would hardly be anticipated, if the grasses of our European meadows were compared with the *Cocoa Nuts* of the *Indies*, but which becomes more apparent when the *Bamboo* is placed by the side of the *Cary*. The *Rattan Palms*, called by *Rumphius* *Palmijunci*, are described as inhabitants of dense forests, where the rays of the sun can hardly penetrate, in which situations they form spiny bushes which obstruct all passage into those jungles, rising to the tops of the highest trees and falling again, so as to resemble a prodigious length of cable, adorned however with the most beautiful leaves, pinnated or terminating in graceful tendrils.

Von Martius, the great illustrator of this noble family, speaks thus of their habits and geographical arrangement :—“ *Palmus*, the splendid offspring of *Tellus* and *Phœbus*, chiefly acknowledge as their native land those happy regions seated within the tropics, where the beams of the latter forever shine. Inhabitants of other world, they barely range beyond 35° in the southern, or 40° in the northern hemisphere. Orbicular species scarcely extend beyond their own contracted limits, on which account there are few countries favourable for their production in which some local and peculiar species are not found ; the few that are dispersed through many lands are chiefly *Cocos nucifera*, *Acrocomia selerocarpa*, and *Borassus flabelliformis*. It is probable that the number of species thus scattered over the face of nature will be found to amount to 1000 or more. Of these not a few love the humid banks of rivers and streams, others occupy the shores of the ocean, and some ascend into alpine regions ; some collect into dense forests, others spring up singly or in clusters over the plains.” *Phœbus*, &c. The testimony of Von Martius is confirmed by Humboldt, who also asserts that there must be an incredible number still to discover in equinoctial regions ; especially if we consider



PL. NCH.



how little is yet known of Africa, Asia, New Holland, and America. He and Bonpland discovered a new species in almost every 50 miles of travelling, so narrow are the limits within which their range is confined. A different opinion appears to be entertained by Schouw, a respectable Danish writer upon botanical geography, whose views deserve to be quoted, although he is far from having had such personal means of judging as Humboldt and Von Martius. He seems to consider that we are acquainted already with the greater part of the Palms; for he says, "it appears from the reports of travellers that such Palm woods as those of South America are less frequent in other parts of the world. Africa and New Holland seem to be less favourable to this tribe, for on the Congo, Smith found only from 3 to 4 Palms; in Guinea we know merely of the same number; and of the other African Palms, 6 belong to the Isles of Bourbon and France; New Holland has, in the torrid zone, three species, while Forster's *Prodromus* of the Flora of the South Sea Islands contains four." It is, however, not to be forgotten that Blume and Griffith have alone added 65 new species to the list of Indian Palms. Blume is of opinion that great numbers still remain to be discovered "in immensis illis et fertilissimis regionibus quarum pleræque primitivâ atque intactâ vegetatione continguntur, neque unquam ab Europæis lustratæ sunt." The most northern limit of Palms is that of *Chamaerops Palmetto* in N. America, in lat.  $34^{\circ}$ - $36^{\circ}$ , and of *Chamaerops humilis* in Europe, near Nice, in  $43^{\circ}$ - $44^{\circ}$  N. lat. They are found in the southern hemisphere as low as  $33^{\circ}$  in New Zealand. "It is remarkable that no species of Palm has been found in South Africa, nor was any observed by M. Leschenault on the west coast of New Holland, even within the tropic." *Brown in Flinders*, 577.

Wine, oil, wax, flour, sugar, salt, says Humboldt, are the produce of this tribe; to which Von Martius adds, thread, utensils, weapons, food, and habitations. The most remarkable is the Cocoa Nut, of which an excellent account will be found in the *Trans. of the Wernerian Society*, vol. v. The root is sometimes masticated instead of the Areca Nut; of the small fibres baskets are made in Brazil. The hard case of the stem is converted into drums, and used in the construction of huts; the lower part is so hard as to take a beautiful polish, when it resembles agate; the reticulated substance at the base of the leaf is formed into cradles, and, as some say, into a coarse kind of cloth. The unexpanded terminal bud is a delicate article of food; the leaves furnish thatch for dwellings, and materials for fences, buckets, and baskets; they are used for writing on, and make excellent torches; potash in abundance is yielded by their ashes; the midrib of the leaf serves for oars; the juice of the flower and stems is replete with sugar, and is fermented into excellent wine, or distilled into a sort of spirit, called Arrack; or the sugar itself is separated, under the name of Jagery. The value of the fruit for food, and the delicious beverage which it contains, are well known to all Europeans. The fibrous and uneatable rind is not less useful: it is not only used to polish furniture and to scour the floors of rooms, but is manufactured into a kind of cordage, called Coir rope, which is nearly equal in strength to hemp; and which Roxburgh designates as the very best of all materials for cables, on account of its great elasticity and strength. Finally, an excellent oil is obtained from the kernel by expression. The juice which flows from the wounded spathes of *Borassus flabelliformis*, *Raphia vinifera*, *Mauritia vinifera*, the Cocoa Nut, and other Palms, is known in India by the name of Toddy. Independently of the grateful qualities of this fluid as a beverage; it is found to be the simplest and easiest remedy that can be employed for removing constipation in persons of delicate habit, especially European females. According to Roxburgh, *Caryota urens* is highly valuable to the natives of the countries where it grows in plenty. It yields them, during the hot season, an immense quantity of this toddy, or palm wine. The best trees will yield at the rate of 100 pints in the twenty-four hours. The pith, or farinaceous part of the trunk of old trees, is said to be equal to the best Sago; the natives make it into bread, and boil it into thick gruel; these form a great part of the diet of the people whose country it inhabits, and during famines they suffer little while those trees last. Roxburgh found it highly nutritious. He ate the gruel, and thought it fully as palatable as that made of the Sago we get from the Malay countries (*Sagus lævis*). *Fl. Ind.* 3. 625.

The finest Sago is prepared from *Sagus lævis* and genuina, trees forming immense forests on nearly all the Moluccas, and so rich in starch that each individual is reckoned to furnish from 600 to 800 lb. of Sago (*Rumphia*, 2. 146); a similar substance is however yielded by *Caryota urens*, *Phoenix farinifera*, and many others.

The *Saguerus saccharifer* (or *Arenga saccharifera*) is one of the most important of the Order. Blume describes it (*Rumphia*, vol. 2. p. 126) as being from 20 to 25 feet high, and very common in the islands of the Indian Archipelago, the Moluccas and Philippines, where it is of the greatest value on account of its saccharine secretions. This juice is obtained continually from the spadixes in large quantities, by wounding and pounding them while on the trees; it yields by fermentation an intoxicating



beverage, and, when boiled, a kind of sugar, consumed for various purposes. When the trees are exhausted by the incessant draining of their fluids, Saps of good quality is obtained from the trunk,—as much as 150 to 200 lbs. weight from a single tree. The timber is extremely hard, and fit for building purposes; and the leafstalks yield annually from 4 to 7 lbs. of the strong black fibres, resembling horsehair, called Gomuti, which are extensively used in the manufacture of cables and various kinds of rope; they are also employed for stretching together thatch, for making brooms (and for similar purposes. (Are those the vegetable bristles now so largely imported for making brooms?) The midribs of the side leaves are converted into pens called *Parus*, and the fine arrows which the Indians blow from their long tubes. Finally, there is at the base of the leaves a fine woolly material (*Paru*) much employed in caulking ships, as (1000) 2 for cushions, and as tinder. Their "Cabbage" is moreover eatable, like that of the West Indian Cabbage Palm, *Areca clemacea*, whose huge terminal bud is known by this name. Egyptian Bel-lum, a gum-resinous substance, formerly employed as a diuretic and diaphoretic, is obtained from *Hyphene thebaica*. Besides the *Sagurus* already mentioned, very considerable quantities of sugar are procured from *Phoenix sylvestris*, a kind of wild date, which Dr. Roxburgh computed to furnish annually in Bengal 100,000 cwt. of date sugar.

The well known Betel Nut is the fruit of *Areca Catechu*, and remarkable for its narcotic or intoxicating power: from the same popular fruit is prepared a kind of Catechu. It has, however, been thought doubtful whether the intoxicating effect of the betel nut is not owing to the Piper leaf in which it is wrapped when eaten, rather than to any special property of its own.

Blume tells us that the Asiatic nations would rather forego meat and drink than their favourite *Areca* nuts; whole ship-loads of which are annually exported from Sumatra, Malacca, Siam, and Cochin-China. They contain a large quantity of tannin, which has caused them to be employed in some part of India for dyeing cotton cloths. The leafstalks, spathe, and timber are employed for many domestic purposes, and in Malabar an inebriating lozenge is prepared from the sap. (*Rumphius*, 2, 97.) In the opinion of this author, the practice of chewing the nuts, although offensive to Europeans, is really very conducive to health in the damp and pestilential regions of India, where the natives live upon a spare and miserable diet. As to the Brazilian Palms, Martins states that the kernel of various species of *Attalea*, when rubbed in water, forms an emulsion used in medicine, both externally and internally. The juice of the watery fruit of *Cocos schizophyllus* is employed in slight ophthalmic attacks.

The fruit of a few of them is eatable; as, for example, the Date Palm, *Phoenix dactylifera*, which furnishes the most important part of their food to the tribes of the desert; some other species of *Phoenix* eaten in India; the Cocoa Nut, too well known to require description; and the Doom Palm, *Hyphene thebaica*, which is called in Egypt the Ginger-bread Tree, because of the extreme resemblance of its brown mealy rind to that sort of cake; *Zakaca edulis*, a kind of Cane, with a juicy, pulpy covering to its seeds, much esteemed by the Burmese; and a few others of less importance. In some, however, the fruit is extremely acrid.

The fruit of *Sagurus saccharifer* is of that nature, exciting severe inflammation in the mouth of those who chew it; it was the basis of the "infernal water" which the Melaneans used in their wars, to pour over their enemies; nevertheless, the unripe albumen forms a beautiful kind of sweetmeat, which the Chinese and Indian nobles drink with their tea; it is prepared by soaking in lime-water and boiling in refined sugar. The same acidity occurs in the fruit of *Caryota urens* and some others.

Oil and wax are only of less common occurrence than farinaceous substances. Palm-oil, of which enormous quantities are employed in Europe as a sort of grease, and in soap and candle making, is chiefly obtained from *Elais guineensis* and *indoceras*, and these trees are also said to yield the best kind of Palm wine. (*Eleagnus thebaica* and many *Coccoloba* are other species whose fruit contains oil. The *Ceroxylon thebaica* or Wax Palm of Humboldt, has its trunk covered by a coating of wax, which exudes from the spaces between the insertion of the leaves. It is, according to Vespucius, a concrete inflammable substance, consisting of 4-5th wax and 1-5th resin. It is a very remarkable fact, first noticed by Brown (*Comp.*, 436), that the plants of this order whose fruit affords oil belong to a tribe called by him *Candide*, which are particularly characterised by the originally trilobular perisperm having three cells when fertile, perisperm opposite the seat of the embryo, and, when abortive, indicated by formica cava. A species called *Carnauba*, in Brazil, throws off waxy scales from its leaves.

Cocoa-nut oil is imported into England in considerable quantities, and it is surprising that it is not more generally used in England; for, instead of the miserable



smell of fish-oil, it has rather an agreeable odour; and it is readily consumed in open glass vessels, with floating or standing wicks, whatever the temperature of the air may be.

The natural secretion of the fruit of *Calamus Draco* constitutes the best D'jurnang or Dragon's Blood, a dark coloured inodorous insipid resin; a second and rather inferior kind is produced from the fruit from which the natural secretion has been removed by heat and bruising; the third and most inferior kind appears to be the refuse of the last process. It is doubtful whether this article is procured from the plant by incisions, as has been supposed.—*Griffith*.

The roots of the American Palmetto have been found to contain a large quantity of tannin.

There seems no end to the economical purposes to which the products of Palms are applied. Their huge and hard-skinned leaves are universally employed as thatch. All the hard-wooded sorts furnish excellent timber. The Brazilian Indians, especially the Puris, Patachos, and Botocudos, manufacture their best bows from the wood of a species of Cocoa-nut, called the Airi, or Brejeuba. Palmyra wood is produced by *Borassus flabelliformis*. Among those best known in Europe are the Rattans, belonging to various kinds of Cane, and so much valued for their flexibility on the one hand, and flinty hardness on the other. Palm walking-sticks (under the name of Penang lawyers), are also very extensively used in England. Mention has already been made of the valuable horse-hair-like bristles obtained from *Saguerus saccharifer*. Fibrous matter is also procured from *Sagus filaris*, a Malay plant, whose bristles are dried and used for sewing linen garments. Ropes and strings are prepared in Afghanistan from the Maizurrie Palm, a species of *Chamærops*, according to Mr. Griffith.

Thousands of boys and girls are employed in Java in weaving into baskets and bags the young leaves of the Gebang Palm (*Corypha Gebanga*, Bl.), one of the most useful of all the species of India; its pith furnishes a sort of Sago; its leaves are used for thatch and broad-brimmed hats; fishing-nets and linen shirts are woven from its fibres; ropes from its twisted leaf-stalks; the root is both emollient and slightly astringent: sliced, it is used in slight diarrhœas, and Waitz even says that it is a most valuable remedy for the periodical diarrhœas which, in the East Indies, attack Europeans out of health.—*Rumphia*, 2. 60.

Finally, the hard albumen of some species is turned to use in manufactures. The Hyphæne furnishes materials for rosaries; and Date kernels have been used by the turner; but the most celebrated is the Vegetable Ivory. This is the produce of a tree found on the banks of the river Magdalena, resembling Palms in its leaves, which equal those of the Cocoa-nut in dimensions, in its torulose scaly stem, and, finally, in the remarkable structure and weight of its fruit.—*Humb.* The Spanish Botanists Ruiz and Pavon also met with it in the groves of Peru in the hotter parts of the Andes, and named it *Phytelphas macrocarpa*. The natives of Columbia call it Tagua, or Cabeza de Negro (Negro's head), in allusion, we presume, to the figure of the nut. Almost all we know about it is contained in the following memorandum, published by the Spanish writers above mentioned. "The Indians cover their cottages with the leaves of this most beautiful Palm. The fruit at first contains a clear insipid fluid, by which travellers allay their thirst; afterwards this same liquor becomes milky and sweet, and it changes its taste by degrees as it acquires solidity, till at last it is almost as hard as ivory. The liquor contained in the young fruits becomes acid if they are cut from the tree and kept some time. From the kernels the Indians fashion the knobs of walking-sticks, the reels of spindles, and little toys, which are whiter than ivory, and as hard, if they are not put under water—and if they are, they become white and hard again when dried. Bears devour the young fruit with avidity." The toys prepared from it by the turner are well known in the London shops, and are much admired for their beautiful texture.

For further details concerning the useful qualities of this interesting race, see *Dr. Royle's Work* in the place above quoted.

#### GENERA.

I. Arecææ.	Euterpe, Mart.	Orania, Zippel.	Calyptrocalyx, Bl.
Chamædorea, Willd.	Enocarpus, Mart.	Arausiaca, Bl.	Iguanura, Bl.
Niomezcharia, Ruiz et Pav.	Oreodoxa, Willd.	Ptychosperma, Lab.	Saguerus, Rumph.
Nunnezia, Willd.	Pinanga, Rumph.	Drymophlæus, Zipp.	Arenga, Lab.
Hyospathe, Mart.	Kentia, Blume.	Harina, Hamilt.	Gomutus, Rumph.
Morenia, Ruiz et Pav.	Oncosperma, Blume.	Orania, Bl.	Caryota, Linn.
Kunthia, H. et B.	Arecæ, Linn.	Wallichia, Roxb.	
Hyophorbe, Gaertn.	Euterpe, Gaertn.	Wrightia, Roxb.	II. Calamææ. — (Lepido-
Sublimia, Commers.	Dypsis, Noronh.	Iriarteæ, Ruiz et Pav.	caryææ, Martius; Cala-
Leopoldinia, Mart.	Noronha, Thours.	Ceroxylon, H. et B.	mina; Griffith.)
	Seaforthia, R. Br.	Cyrtostachys, Bl.	* Pinnated.
			Calamus, Linn



*Palmitifolius*, Rumph.  
*Zalacca*, Reinw.  
*Plectocomia*, Mart.  
*Ceratolobus*, Blume.  
*Demonocarpus*, Blume.  
*Calamosagrus*, Griff.  
*Eugeissona*, Griff.  
*Raphia*, Palis.  
*Sagass*, Gaertn.  
*Microcylon*, Rottb.

\* & *Fan-leaved*.  
*Maeritia*, Less., et.  
*Lepidocaryum*, Mart.

III. *Borissœa*

\* & *Fan-leaved*.  
*Borissœa*, Linn.  
*Lodicea*, Rumph.  
*Phadoborpus*, Blume.  
*Lodoicea*, Labill.  
*Lutanea*, Gaertn.  
*Cleopatra*, Gaertn.

*Hyphaene*, Gaertn.  
*Cochberg*, Dold.  
*Doum*, Lam.  
 \* & *Pinnated*.  
*Bentinckia*, Berry.  
*Kepleria*, Mart.  
*Geonoma*, Willd.  
*Geostium*, Poiteau.  
*Vouay*, Aubl.  
*Manicaria*, Gaertn.  
*Pilophora*, Jacq.

IV. *Corypha*

§ 1. *Subulideæ*.  
*Corypha*, Linn.  
*Taliera*, Mart.  
*Gamburget*, Blume.  
*Livistona*, R. Br.  
*Licuala*, Rumph.  
*Saribus*, Rumph.  
*Bissula*, Rumph.  
*Pericycla*, Blume.

*Trachos*, Mart.  
*Corypha*, Mart.  
*Corypha*, Mart.  
*Corypha*, Mart.  
*Sabal*, Linn.  
*Clanathus*, Linn.  
*Corypha*, Mart.  
*Phœnix*, Cav.  
*Trithrinax*, Mart.  
*Rhapis*, Linn. fil.  
*Thrinax*, Linn. fil.

§ 2. *Phœnicideæ*

*Phœnix*, Linn.  
*Elate*, Ait.

V. *Cocoeæ*\* *Spiny*.

*Desmoncus*, Mart.  
*Aititara*, Maregr.  
*Bactris*, Jacq.  
*Guilielma*, Mart.  
*Martinezia*, Rottb. et Poe.

*Desmoncus*, Mart.  
*Aititara*, Maregr.  
*Bactris*, Jacq.

\* & *Fan-leaved*.  
*Syagrus*, Mart.  
*Diplothemium*, Mart.  
*Maximiliana*, Mart.  
*Jubaea*, R. B. & K.

*Orbignya*, Mart.  
 ? *Alagoptera*, Nees.  
*Phytelephas*, Rottb.  
*Nipa*, Thunb.

NUMBERS. GEN. 73. Sp. 400.—(1000 Martius.)

Pesunia

*Papilionacea*.

PALMACEÆ.

*Juncaceæ*.



ALLIANCE X. *HYDRALES*.—THE HYDRAL ALLIANCE.

DIAGNOSIS—*Unisexual aquatic Endogens, with perfect or imperfect flowers, not arranged on a spadix, and without albumen.*

The essential character of the Hydral Alliance consists in its ♂ ♀ flowers and exalbuminous seeds ; it is therefore necessary to expel all those genera, which, like Potamogeton, have been placed among the Naiads although they are ♂ ; for in truth there is nothing except the diclinous character which can distinctly divide the Arrow-grasses from the Naiads. Among the Frogbits, however, a couple of genera occur which are described as being truly ♀ and yet cannot be referred to any other Order, and they therefore constitute real exceptions to the otherwise positive distinction. The Hydrals are all, as their name indicates, strictly aquatic, no instance of a land-plant occurring among them. They divide into three well-marked Orders, namely :

- Stamens epigynous ; ovary adherent* . . . . . 39. *HYDROCHARIDACEÆ*.
- Stamens hypogynous ; ovary free ; pollen globose* . . . 40. *NAIADACEÆ*.
- Stamens hypogynous ; ovary free ; pollen confervoid* . . 41. *ZOSTERACEÆ*.

The genera of these Orders demand, however, a much more careful examination than they have yet had, and considerable changes may be expected among them ; for it is uncommon to find in the same Order so much diversity of condition as occurs among the Naiads and Frogbits as at present constituted.

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The order of Triurids, in the former editions referred to Dictyogens, upon erroneous descriptions, now finds a place here with the following diagnosis :

- Stamens hypogynous ; ovaries 00, free ; embryo rudimentary ; pollen globose* . . . . . 40 bis *TRIURIDACEÆ*.



## ORDER XXXIX. HYDROCHARIDACEÆ.—Hydrocharitaceæ.

*Hydrocharitoides*, *Juss.* Gen. 67 (1789). *Hydrocharitaceae*, *D. D. R.* 2: 114. *S. B. G.* 1: 344 (1810), *Koch et al. Med. Bot.* vol. 1, no. 103. *Flore de France* 316 (1877) (*France*).  
*Melrose, p. 10*. *Vakhtangovskii Stranitskii, Russ. Revist.* 4: 24 (1900). *Amerikanskii Botan. revist.* 161.

DIAGNOSIS. *Head of E. lobatus* with  $\alpha_1$  pigments, trace  $\alpha_2$ , and no  $\alpha_3$ .

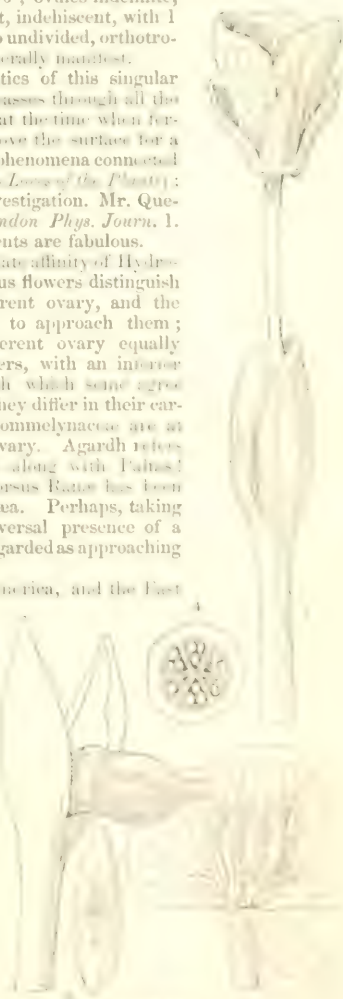
Floating or water-plants. Leaves with parallel veins, sometimes stem leaves enclosed in a spathe,  $\frac{1}{2}$  to (or occasionally  $\frac{3}{4}$ ). Sepals 3, herbaceous. Petals 1, petaloid, occasionally absent. Stamens definite or indefinite. Ovary atheroid, composed of several carpels, and 1-6-8-9-celled; stigmas 3-6; ovules indefinite, anatropal, often parietal. Fruit dry or succulent, indehiscent, with 1 or more cells. Seeds without albumen; embryo undivided, orthotropal, with a plumule more or less lateral and generally manifest.

Such appear to be the essential characteristics of this singular group of plants, whose inflorescence lives and passes through all the stages of its existence under water, except just at the time when fertilization is necessary, when the flowers rise above the surface for a few hours. Darwin has celebrated the so-called phenomena connected with this function in *Valisneria spiralis*, (see *His Logic of the Plants*); but they are greatly in need of more accurate investigation. Mr. Quekett, in an elaborate memoir on this plant, (*London Phys. Journ.* 1. 65.) considers that a part at least of the statements are fabulous.

It is not easy to determine what is the immediate affinity of Hydrocharads. Their exalbuminous seeds and declinous flowers distinguish them from Bromeliaceæ, to which their adherent ovary, and the habit of the Water-soldier (*Stratiotes*) seems to approach them; from Naiads, their indefinite seeds and adherent ovary equally divide them. By their tripetaloidous flowers, with an inferior ovary, they are separated from Alismads, with which some agree in habit and want of albumen, but from which they differ in their carpellary leaves being definite, not indefinite. Commelynaceæ are at once recognised by their superior trilocular ovary. Agardh refers here *Tropæol.* Linnæus placed Hydrocharads along with *Parnass.* in his natural arrangement. Hydrocharis *Morsus Rææ* has been compared, and not unaptly, to a pigmy *Nymphæa*. Perhaps, taking into account their declinous flowers, the universal presence of a spathe and their aquatic nature, they may be regarded as approaching to Arads through Lemnads.

Natives of fresh water in Europe, North America, and the East Indies. One species is found in Egypt (*Damasonium indicum*), and two *Vallisnerias* in New Holland. A few occur in estuaries of the sea.

Nothing is known of their uses, unless that the fruit of *Enhalus* is eatable, and its fibres capable of being woven, according to Agardh (*Aph.* 128). The Jangi of Hindostan, called *Vallisneria alternifolia* by Roxburgh, *Hydrilla* 3 by Hamilton, is one of the plants used in India for supplying water mechanically to sugar in the process of refining it, "as clay is used in the West Indies to permit the slow percolation of water."—*Royle*. The herbage of *Hydrocharis Morsus Rane* is mucilaginous and slightly astringent. *Ottilia* and *Boottia* are eaten in India as potherbs.



Y. 2011

Fig. XCHL.—*Stratiotes aloides*. 1, a flower and spathe; 2, a fruit (seed 1/4 in.); 3, a fruit in dissection; 4, a section of the fruit; 5, an anther.



## GENERA.

Tribe 1.—Vali-nereæ <i>Ovary 1-celled.</i>	Lagarosiphon, <i>Harvey.</i> Vallisneria, <i>Michel</i> <i>Physcium</i> , Loureir. Blyxa, <i>Thouars.</i> <i>Saivala</i> , Wall.	Stratiotes, <i>Linn.</i> <i>Aloides</i> , Boerh. Enhalus, <i>L. C. Rich.</i> Ottelia, <i>Pers.</i> <i>Damasonium</i> , Schreb. <i>Hymenotheca</i> , Salisb. Bootia, <i>Wall.</i>	Linnobium, <i>L. C. Rich.</i> <i>Hydromystria</i> , F. G. W. Meyer. <i>Jalambiea</i> , Llav. et Lex. Hydrocharis, <i>Linn.</i> <i>Stratiotes</i> , Dillen.
Udora, <i>Nutt.</i> <i>Elodea</i> , <i>L. C. Rich.</i> <i>Philotria</i> , Rafin. Anacharis, <i>Rich.</i> Hydrilla, <i>Rich.</i> <i>?Hydrospondylus</i> , Hskl.	Tribe II.—Stratioteæ. <i>Ovary 6-8-9-celled.</i>		

NUMBERS. GEN. 12. Sp. 20?

*Pistiaceæ.*

POSITION. ———— HYDROCHARACEÆ.—Naiadaceæ.

*Bromeliaceæ.*

## ADDITIONAL GENERA.

Aptanthæ, <i>Planchon</i> , near Udora. Neehamandra, <i>Id.</i> near Valisneria. Egeria, <i>Id.</i> near Hydrilla.	Lagarosiphon, <i>Harr.</i> Epigynanthus, <i>Blanc.</i> <i>?Diplosiphon</i> , <i>Denc.</i>	} Hydrilla
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Common in extra-tropical countries, either inhabiting fresh water, or the shores of the ocean, but also found near the equator.

Their uses are unknown.

GENERA.

Caulipia, Willd.	Phyllospadix, Hook.	Tetroncium, W.	Althenia, Petit.
Ittnera, Gmel.	Zannichellia, Michel.	Cathantes, Rich.	Bellevalia, Delil.
Najas, Willd.	Lilæa, H.B.K.	Halodule, Endl.	
Fluvialis, Michel.	Heterostylus, Hook.	Diplanthera, Thouars.	

NUMBERS. GEN. 9. Sp. 16.

*Juncaginaceæ.*

POSITION.--Hydrocharidaceæ.--NAIADACEÆ.--Zosteraceæ.

*Thallogens.*



## ORDER XL. THE TRIURIDACEÆ.—TRIURIDÆ.

*Triuridaceæ*.—*Mon. incl. Mon. 10 p. 10 (1841). Ann. Bot. Soc. Lond. 1842, p. 10. (Cyclopædia botanica.)*  
*in Linn. Press 10 p. 10 (1841). Aristæus. Hæst. 10 p. 10 (1841).*

**DIAGNOSIS.**—*Hydral Endogens*, with *Aggremated* network, 100 *per* *ovary*, *peristylous* *embryo*, and *album* *nucleus*.

Little perennial subhyaline plants with creeping rhizomes. Stem simple, erect, of cellular texture, having a small central axis of fibrous tissue, with minute haematoxylous, a termate columnless round leaflets, dentate or serrate. Inflorescence in terminal, long-spikeletted, or few-flowered racemes, with alternate pedicelled monostichous or diastichous, rarely polygametes, tubulate flowers; pedicels bracteate at base. Perianth similar in both sexes, hyaline, with a short tube at base, and a border divided into 3-4-5-8 acute segments, valvate in activation, which are sometimes furnished with extremely long processes, curled and enclosed in the bud. Stamens few, variable in number, almost sessile upon a fleshy receptacle, which is sometimes depressed in the bottom of the perianth, or frequently large and elevated in the form of a cone; anthers 4-linear, 2-lobed, 2-valved, sometimes formed of two separate lobes. Ovaries numerous, aggregated on a receptacle springing from the torus, 1-locular; ovule solitary, erect from the base. Style excentric, sometimes lateral, or nearly basal, smooth or feathery. Stigma obsolete or subclavate. Carpels numerous, small, drupaceous, radiating horizontally from the receptacle, *obovate*, marked by the persistent nearly basal style, numerous and indistinct, or sometimes unguiculate, bursting longitudinally by a dorsal fissure, 1-seeded. Cergones obscure, enveloped in an arilliform network. Teste ovate, hard, testaceous, transversely marked with ladder-shaped stria. Nucleus opaline, enclosed in a serrulated integument, and composed of a number of homogeneous cells containing an oily granular substance, without any trace of an embryo.—*Moss MSS.*

The foregoing character has been obligingly communicated to me by Mr. Moss, who has made the order the subject of special study, the result of which he has published in the 21st vol. of the Transactions of the Linnean Society. Along with the general description of the order I was also favoured with the following particulars.—One of the most singular features is the existence of monogamous seeds, viz. we have here a perfectly developed albuminous kernel, without any trace of the usually defined embryo. The late Mr. Griffith in his admirable memoir on *Balanophora*, (Trans. Linn. Soc. 20, p. 101 and 102, pl. 8, figs. 9-14), has pointed out the same occurrence in the seeds of that genus. In *Rafflesia* we see an embryo, as in *Capota*, referred to the most simple form, *i.e.* a mere homogeneous cellular or granular mass, *peristylous* without the appearance of either radicle, cotyledon, or plumula. In *Thurmannia*, the embryo consists of a reticulated arilliform network, enclosing a portion that bears no indication of either radicle or cotyledon. It appears, therefore, probable that in the *Burmanniaceæ*, *Balanophoraceæ*, *Triuridaceæ*, &c. the embryonic endosperm is a body homogeneous in texture, consisting of a series of cells or granules, which have the power of pululating at certain points, and thus performing all the separate processes of reproducing their very simple form of structure, in a somewhat analogous way to that which the ordinary embryo effects in the more complex organization of vascular fibres and elaborate tissues in the higher series of phanerogamous plants. We find something analogous among the *Amrociæ*, where *Amorphocaulis* germinates in an albuminous simple nucleus, homogeneous in texture, and where one of the extremities pululates at 1, 2, or 3 points, throwing out fleshy lobes which covering each other. *Aglaonema*, too, has a solid nucleus, which in germination throws out several apices at each end, and the nucleus of *Cryptocoryne*, according to Schott, sends several



Fig. XCV. Magnified analysis of *S. Smithii* (Triuridaceæ). 1, cross flower; 2, longitudinal section; 3, ripe pistil; 4, ovary; 5, ripe seed.



gemmules in a similar manner. This has been confirmed by the researches of Griffith, showing that in *Ambrosinia* the embryo, at first quite homogeneous and entirely cellular, throws out from different parts of its surface minute oblong cellular bodies, which soon enlarge until they become five or six times the length of the original nucleus, from which they finally detach themselves, assuming the form of a large plumula, and serving as the germs of future plants. This bears much analogy to the germination of *Ceratophyllum*, which throws out an external series of processes, that have been compared to a great number of cotyledons, while the still more numerous inner series bears the semblance of a highly developed plumule. The leaves of this last-mentioned genus appear destitute of nervures, and to consist only of confervoid parallel cells, which divide themselves dichotomously into hair-like segments, thus denoting a lower degree of development than has been assigned to it. The genus, too, has monœcious flowers, with a simple perianth, with valvate æstivation, almost sessile anthers, an unilocular carpel with a solitary ovule.

"I have shown that the supposed facts upon which Mr. Gardner suggested the relation of the *Triuriaceæ* to the *Menispermaceæ* and *Smilacæ*, and of *Sciaphila* and *Hyalisma* to the *Urticaceæ*, are founded in error, and that their affinity towards the *Naiadaceæ*, which the structure of *Triuris* first suggested, is much confirmed by the subsequent additions to our knowledge of the organisation of other genera of this family. They agree with that order through *Potamogeton* in their inconspicuous ♂ ♀ flowers, a perianth of four segments with valvate æstivation, several distinct carpels, containing a single ovule, and seeds with a testaceous putamen containing a large macropodous embryo. Some analogous points of structure in the fruit and seed of *Pistia* have also been indicated by the same authority.

"All the plants constituting this family have been found in intertropical South America, Java, Ceylon, and the Philippine Islands, always in moist shady places, and deriving their nourishment from the roots of trees.

#### GENERA.

TRIBE TRIURÆÆ.  
*Triuris*, Miers.  
*Hexuris*, Miers.  
*Peltophyllum*, Gardn.

TRIBE SCIAPHILÆÆ.  
*Soridium*, Miers.  
*Sciaphila*, Bl.  
*Aphollia*, Champ.  
*Hyalisma*, Champ.

NUMBERS. GEN. 5. Sp. 8.

*Ceratophyllaceæ.*

POSITION.—*Naiadaceæ*.—*TRIURIDACEÆ*.—*Alismaceæ*.—*Burmanniaceæ*.  
*Araceæ*."

The only observation that I would make upon the foregoing views is that what Mr. Miers terms an inembryonal embryo I should rather call an exalbuminous embryo.

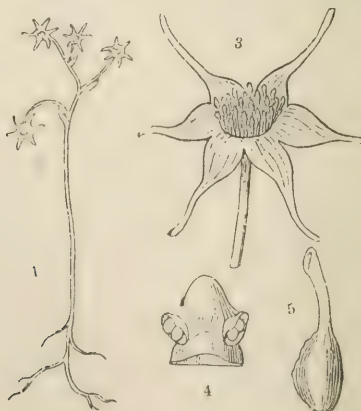


Fig. XCV. bis.

Fig. XCV. bis.—1. *Hexuris Gardneri*; 3. its flower; 5. its carpel; 4. anther of *Triuris hyalina*.—Miers.



## ORDER XII. ZOSTERACEÆ.—SEA WEEDS.

Zosteraceæ: *Najas* (L.) Kütz. — *Zostera* (L.) Smith, (near *S. filiformis*) — *Posidonia* (L.)DIAGNOSIS. *Hyphal Eudipneæ with large, green, flattened, jointed, creeping, and sometimes upright*

Marine plants resembling sea weeds and living among them. Leaves grassy, flat, sheathing at the base. Flowers very minute, absolutely naked, or surrounded by 3 scales,  $2 \times 2$ , arranged within herbaceous spathes.  $\sigma$  Anthers definite in number, one or two-celled, sessile; pollen filamentous, resembling fine confervæ.  $\gamma$  Ovary free, one-celled; ovule solitary, pendulous, campylotropal; or parietal with the funiculus downwards; stigmas 1 or 2, capillary. Fruit drupaceous, one-seeded. Seed pendulous; albumen 0; embryo antitropal or homotropal, with a very large radicle, and a highly developed plumule lying in its cavity.

If we are to find anywhere a positive intermediation of flowering with flowerless plants it is here, where with naked flowers, but distinct sexes, we have the pollen in a condition that may be well compared to the claters of *Marchantia* and its allies, and totally different from all that is known in other flowering plants. The habit too is quite that of sea weeds. It therefore seems expedient to separate these genera from the Naiads, which are an Order higher in organization, and in fact differ in nothing from the common types of flowering structure, except in their simplicity. The manner in which fertilization takes place among these plants is unknown. *Zostera marina*, whose flowers of both sexes are inclosed in a spathe filled with air, offers indeed no insuperable difficulty to the supposition that in such a situation, although the plants are under water, yet the flowers may be in a dry medium; but, as Vaucher has observed, this does not assist us to understand how fertilization is effected in *Zostera maritima* which is dioecious. Does the confervoid pollen float to the place where it is wanted?

The bottom of the ocean is the locality of these plants, which occur from the North Sea to the Mediterranean, the Indian Ocean and the coasts of Arabia. One species indeed, *Amphibolis zosterifolia*, is seen on the shores of New Holland, and another in the West Indies.

They can scarcely be said to form any part of the vegetation subdued by man, except in the case of the Sea wrack, *Zostera marina*, which is a common material for packing, and for stuffing cottagers' cushions, and has also been used for tumours, owing apparently to the iodine of the sea weeds that are gathered with it.

## GENERA.

<i>Cymodocea</i> , <i>Keunt.</i>	<i>Thalassia</i> , <i>Sw.</i>	<i>Posidonia</i> , <i>Lam.</i>
<i>Amphibolis</i> , <i>Aph.</i>	<i>Zostera</i> , <i>L.</i>	<i>Halodule</i> , <i>W.</i>
<i>Gracilaria</i> , <i>Rehdb.</i>		<i>Cratogeomys</i> , <i>DC.</i>

NUMBERS. GEN. 5. Sp. 12 (Kunth).

POSITION. ——— *Cymodocea*,  
 ——— *ZOSTERACEÆ*. — *Naiadaceæ*.  
 ——— *Alveolaceæ*.

FIG. XCV.

FIG. XCV.—*Zostera Noltii*. 1. An anther; 2. a section of the ovary, showing the ovule and the funiculus; 3. a seed; 4. the same seed, but with the plumule and the embryo opened and discharging its confervoid pollen. — *N. L.* *Zosteræ*.



# ALLIANCE XI. NARCISSALES.—THE NARCISSAL ALLIANCE.

DIAGNOSIS.—*Epigynous petaloid Endogens, with symmetrical flowers, 3 or 6 stamens, and albuminous seeds.*

From the Hydral Alliance and its higher forms, such as the Water Soldiers (Stratiotes), we pass, by an easy transition, to the Narcissals, which may be regarded as hermaphrodite Hydralis growing on dry land, and having albumen in their seeds. This transition is effected by the Bromelworts (Bromeliaceæ), which have quite the same habit, and in addition a tripetaloid flower. This point being settled, the remainder of the Alliance consists of plants which might be regarded as Lilials, if their ovary were not adherent; for it is difficult to separate the Irids from Melanths or the Amaryllids from Lilyworts, by any other precise character.

The principal difficulty in limiting this Alliance arises out of the Bromelworts, some of whose genera have the ovary absolutely free: but such plants are not at all like any other part of the system, and if their calyx is free, it is so fleshy or permanent as to have all the external appearance of being adherent to the ovary.

While however there is, as has been stated, a gentle passage from Hydralis into Narcissals, we find, on the other hand, the Aral Alliance provided here with its representative in the form of the Taccads, which have much the habit of some Arads, and nevertheless an adherent ovary and almost tripetaloid flower. These plants have also a very evident resemblance to Onoriaceæ.

## NATURAL ORDERS OF NARCISSALS.

- |  |                       |
|--|-----------------------|
| <i>Flowers tripetaloidous, 6-leaved, imbricated. Albumen mealy</i>       | . 42. BROMELIACEÆ.    |
| <i>Flowers half tripetaloidous, tubular. Albumen fleshy</i>              | . . . . 43. TACCACEÆ. |
| <i>Flowers hexapetaloidous, tubular, scarcely imbricated. Stamens 3,</i> | } 44. HEMODORACEÆ.    |
| <i>opposite the petals, or 6; anthers turned inwards. Radicle</i>        |                       |
| <i>remote from the hilum, which is naked</i>                             | . . . . .             |
| <i>Flowers hexapetaloidous, much imbricated. Stamens 6; anthers</i>      | } 45. HYPOXIDACEÆ.    |
| <i>turned inwards. Radicle remote from the hilum, which is often</i>     |                       |
| <i>strophiolate</i>  | . . . . .             |
| <i>Flowers hexapetaloidous, much imbricated. Stamens 6, or more;</i>     | } 46. AMARYLLIDACEÆ.  |
| <i>anthers turned inwards. Radicle next the hilum</i>                    |                       |
| <i>Flowers hexapetaloidous. Stamens 3, opposite the sepals; anthers</i>  | } 47. IRIDACEÆ.       |
| <i>turned outwards</i>   |                       |



## ORDER XLII. BROMELIACEÆ. — Bromeliaceæ.

*Bromelia*, *Jour. Giss. An. 1789*; *Bot. Sc. Nat. p. 47*. (1807). — *Brumeliaceæ*, *Frucht. in den Botan. Zeit.* (1807); *Brum. Germ. N. 7. 49*. (1809). — *Sagitt. p. 76*. (1813). *Bot. Zeit. Bot. Zeit. Bot. Zeit.* (1813).  
*Ind. Gen. IV.*, *Mot. p. 100*. — *Thunberg. Atl.*, 1808, *comp. Bot. Zeit.* (1813).

**DIAGNOSIS.**—*Novennial Plant*, and with triquetral, subequal, almost hoary pubescence; deciduous, and rarely arborescent.

Stemless or short-stemmed plants, with rigid chasmoid leaves often provided with cuticular scales, and spiny at the edge or point. Flowers with gay colours, in racemes or panicles. Calyx persistent or deciduous, persistent, never withering, more or less covering with the ovary, smaller bracteoles, sometimes coloured. Petals 5, coloured, withering or deciduous, equal or unequal, rigidly indurated. Stamens 6, inserted into the tube of the calyx, but corolla; anthers opening longitudinally. Ovary 3-celled, many-seeded; ovules anatropal; style single; stigma dilated, or bifid, often two-lobed. Fruit capsular or somewhat swollen, many-seeded. Seeds generally in most cases, always numerous, with a leathery skin, or tapering into a slender thread; embryo taper, curved or straight, arising from the base or nearly aligned with the paleis from the hilum.

Stratiotes among the Hydrocharitidæ had so much the foliage of this Order as to render it probable, taking the fruit into consideration, that the nearest affinity of the Bromeliaceæ Order is with the Gramineæ. It is, however, essentially distinguished by its seeds having many albumen. The

circumstance also cuts it off from the Amaryllids and Hypoxids. The habit of Bromeliads is peculiar; they are hard dry-leaved plants, often with a scurfy surface; the species are frequently capable of sustaining long drought without injury. There can be no doubt about the Order belonging to an epiphytic series, and the whole race of Tillandsias has the ovary free; but it is more, I believe, wholly so, but has always so much union to the calyx at the base as well as an inherent tendency. Besides, the sepals are always as fleshy, to the last, as if they were completely incorporated with the ovary. Nevertheless, Adrien de Jussieu regards the free genera as a peculiar Order, which he calls Tillandsiæ.

All, without exception, are natives of the continent or islands of America, where they have migrated eastwards in such numbers as to have established themselves as part of the present Flora of the west coast of Africa, and some parts of the East Indies. They are all capable of existing in a dry hot air without contact with the soil; on which account they are favourites in South American gardens, where they are supported in the buildings, or hung to the balustrades of the balconies; sometimes in which they flower abundantly, filling the air with fragrance.

The most remarkable species is the Pine Apple, or *ANANAS*, which is well known for the sweetness and fine aromatic flavour of its fruit; in its wild state, however, and before its fruit is excessively acid, burning the gums. In the West Indies it is employed along with *Bromelia Pinguin* and others, to destroy intestinal worms, and to promote the secretion of urine. *Tillandsia usneoides* hangs down from the trees at the base of tropical America like long dry beards, and is used for making linen, and in the

Fig. XLII.—1. Flower of *Bromelia fastuosa*, L. a flower of *Tillandsia fragrans*, L. the expanded the same; 4. its seed; 5. a cross section of the seed of *Tillandsia fragrans*; 6. a specimen of a petal; 7. a cross section of the ovary of *Bromelia fastuosa*.



preparation of an ointment used against hæmorrhoids. *Puya chilensis* yields an extract used in healing broken bones ; a transparent gum flows from the spike of *Puya lanuginosa*. A yellow colour is extracted in Brazil from the root of *Billbergia tinctoria*. Ropes are made in Brazil from a species of *Bromelia*, called *Grawatha* ; and very fine muslin has been manufactured from the fibres of the common Pine Apple.

# GENERA.

<i>Ananassa</i> , Lindl.	<i>Aræococcus</i> , Brongn.	<i>Amalia</i> , Hort. hispan.	<i>Dyckia</i> , Schult. fil.
<i>Ananas</i> , Tournef.	<i>Cryptanthus</i> , Klotsch.	<i>Strepsia</i> , Nutt.	<i>Encholirium</i> , Mart.
<i>Bromelia</i> , Linn.	<i>Brocchinia</i> , Schult. fil.	<i>Caraguata</i> , Plum.	<i>Pouretia</i> , Ruiz et Pav.
<i>Karatas</i> , Plum.	<i>Pitcairnia</i> , Herit.	<i>Devillea</i> , Bert.	<i>Puya</i> , Molina.
<i>Ananas</i> , Gaertn.	<i>Hepetis</i> , Swartz.	<i>Guzmania</i> , Ruiz et Pav.	<i>Renealmia</i> , Feuill.
<i>Aechmea</i> , Ruiz et Pav.	<i>Spirastigma</i> , Herit.	<i>Bonaparteia</i> , Ruiz et Pav.	<i>Achupalla</i> , Humb.
<i>Oechmea</i> , Juss.	<i>Vriesia</i> , Lindl.	<i>Acanthospora</i> , Spr.	<i>Hechtia</i> , Klotsch.
<i>Billbergia</i> , Thunb.	<i>Neumannia</i> , Brongn.	<i>Misandra</i> , Dietr.	<i>Dasyllirion</i> , Zucc.
<i>Hohenbergia</i> , Schult. fil.	<i>Tillandsia</i> , Linn.	<i>Navia</i> , Mart.	? <i>Roulinia</i> , Brongn.
<i>Acanthostachys</i> , Klotsch.	<i>Renealmia</i> , Plum.	<i>Cottendorfia</i> , Schult. fil.	

NUMBERS. GEN. 23. Sp. 170.

# *Hydrocharidaceæ.*

POSITION.—*Hæmodoraceæ.*—*BROMELIACEÆ.*—*Hypoxidaceæ.*

# ADDITIONAL GENERA.

<i>Disteganthus</i> , Lemoine.	<i>Pironneava</i> , Gaudich.
<i>Chevalieria</i> , Gaudich.	<i>Pholidophyllum</i> , Vis.
<i>Guesmelia</i> , Id.	



Fig. XCVI.\*

Fig. XCVI.\*—*Echeura fulgens.*—Paxton.



ORDER XLIII. TACCACEÆ. *Tacca*.

*Tacca*, *Prod. Rupp.*, *Hort.* 1. 140. 1806. | *Rev. Bot. Soc. St. Albans*, *Compos.* 466. 1810. | 1843. | *L.f.*, *pl. penic.* 600. 1845. | *Bot. Beecheyi*, *Mon.* 1846.

DIAGNOSIS. *Narcissal* (*Eranthis*) with (but not like) *Hyacinthaceæ* (in general habit & structure).

Large perennial herbs, with a tuberosus root. Leaves all radical, entire, unnotched or petiolate, the segments pinnatifid and entire, with cuneate petioles & veins. Spikes 6.

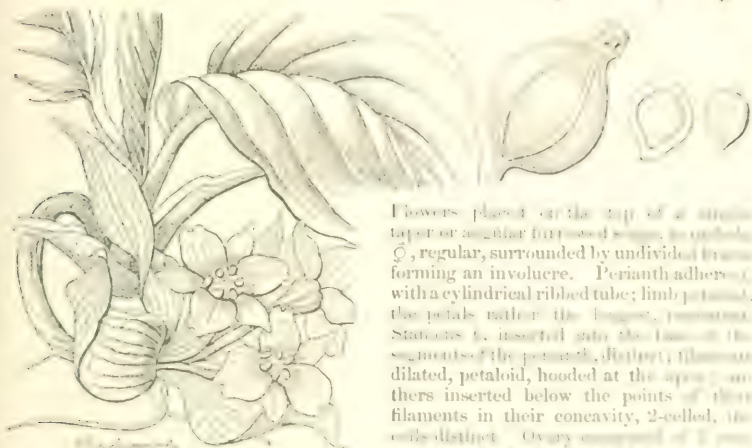


FIG. XXVII.

Flowers placed on the top of a slender taper or angular furrowed stem, in umbels  $\odot$ , regular, surrounded by undivided bracts forming an involucre. Perianth adherent, with a cylindrical ribbed tube; limb petaloid, the petals rather the longest, persistent. Stamens 6, inserted into the base of the segments of the perianth, filaments dilated, petaloid, hooded at the apex; anthers inserted below the points of their filaments in their concavity, 2-celled, the cells distinct. Ovary composed of 2 free rate carpels, 1-celled, at last 2-celled, with a parietal polypermous placenta & ovule.

ascending and anatropal, or horizontal and amphitropal; style 2, connate, sigmoid connate at the base, radiating, 2-lobed. Pericarp beaked, 1-lobed, 1-celled, or 2-3-celled, many-seeded. Seeds lunate or somewhat ovate, striated. Albumen fleshy. Embryo placed inside the albumen in the region of the hilum, or remote from it.

Personally I have had no opportunity of examining critically the plants which compose this small Order. They are in some respects like Aracæ, as others like Campanulaceæ (*Tacca hevis*); but certainly have nothing to do with Dicotyledons. Blume has the following remarks upon *Tacca*, *Flora* 1. 32. "The genus *Tacca* offers the type of a new family between Aracæ and Aristolochiaceæ. To the former it approaches closest in habit, especially in the leaves, but it is very different from them in the structure of the parts of fructification. For in no species of true Aracæ do we find the perianth, properly so called, to be found; what we have the custom of calling so in *Dracontium* and others, is nothing but scales, and not even a calycine component; the perianth is, moreover, superior in *Tacca*. By this superior position the affinity with Aristolochiaceæ is evident; but from those too *Tacca* differs in the situation of the stamens, which are not as in that Order adherent to the wall with an anther pointing outwards, but are placed on the perianth itself with the anthers turned inwardly. In *Tacca* it is probable that there are several germinating plants upon the tubers, analogous to the double or triple plumule of *Dracontium*; hence embryonal scales which may be said to be tubers formed in the fruit itself. Brown long since stated (*Philosoph.* 1810) that a relation is established between Aracæ and *Bithyris* by means of *Tacca*. See also *Agardh's Atlas* 245. For my own part, however, this resemblance to Birthworts seems so very slight as to be unworthy of notice. The true relation is with the Aracæ, or at least with those plants which are here represented under the name of *Orontiaceæ*, of which these seem to be an epigynous form. I doubtless compare them with *Yams*, to which they appear to have even less resemblance than to the Birthworts.

FIG. XXVII. 1. *Tacca integrifolia*, 2. fruit of *T. integrifolia*, 3. part of the same fruit with the style removed; 4. section of its albumen and embryo.



Found in damp maritime places and woods in the hotter parts of India, the South Sea Islands, and the tropical parts of Africa.

"The plants of this family are possessed of some degree of acidity, both in their tubers and in their herbaceous parts, as Rumphius informs us that the tubers of *T. pinnatifida*, *dubia*, and *montana* are rasped and macerated for four or five days in water, and a fecula is separated in the same manner that sago is, and like it employed as an article of diet by the inhabitants of the Malayan and Molucca Islands. In Otaheite and other Society Islands, they make cakes of the meal of the tubers of *T. pinnatifida*, which are the *Tacca youy* of some navigators; they form an article of diet in China and Cochin China, as also in Travancore, where Dr. Ainslie informs me they attain a large size, and that the natives eat them with some acid to subdue the acrimony."—*Royle*.

	GENERA.	
<i>Tacca</i> , <i>Forst.</i>		<i>Ataccia</i> , <i>Presl.</i>
NUMBERS. GEN. 2. Sp. 8.		
	<i>Orontiaceæ.</i>	
POSITION ———	TACCACEÆ.—Bromeliaceæ.	
	<i>Aracææ.</i>	

Gardner was of opinion that *Trichopodium* should be transferred from Birthworts to this order, a further indication of the natural affinity of the latter to either Endogens or Rhizogens.



# Order XLIV. HÆMODORACEÆ. Blood Root.

Hæmodoraceæ, R. Brong. Prodr. 229. 1810; Engelm., Index. The name is from the Greek hæma, blood, and doros, root.

DIAGNOSIS.—*Narcissal Endoparas with long-petioled, somewhat tubular flowers, 3 stamens opposite the petals or 6, anthers curved inwards, and generally sessile from the below united ovules.*

Herbaceous plants with fibrous perennial roots and permanent scabrid or glaucous leaves, which are mostly in two ranks. Flowers ♂. Perianth usually more or less woolly, adherent; the sepals and petals in many cases urticulate-fimbriate and united into a (cylindrical) tube. Stamens arising from the sepals and petals, either 3 and opposite the petals, or 6; anthers bursting inwards. Ovary with the cells 1-2- or many-seeded, adherent, usually 3-celled,



FIG. XCVIII.

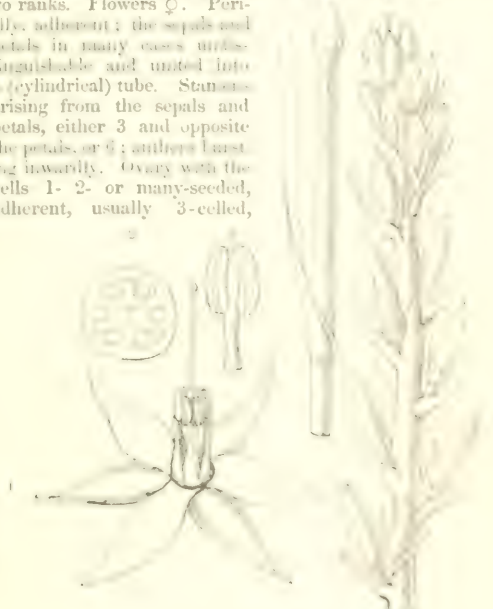


FIG. XCVIX.

occasionally 1-celled, with a placenta occupying only a point of the (con) vexal surface; stigma undivided; ovules amphitropal. Fruit covered by the ventral pericarp, capsular, valvular, seldom indehiscent, somewhat nuculeous, with the placentas easily separable from the dissepiments, if any. Seeds either minute or indurated, fixed by the base or peltate, winged or wrinkled and angular. (Embryos from 6 cartilaginous albumen, short, straight, with the radicle usually remote from the hilum. Small.)

The distinction between these and Amaryllids consists in their perianth not having the regular equitant position of sepals and petals which is found in the latter, in their constantly equitant leaves, and in their flowers, which have frequently a woolly surface, and a small limb compared with the tube. From these they are divided

Fig. XCVIII.—*Clavaria sanguinalis*. 1. A flower and root of *Clavaria sanguinalis*.

Fig. XCVIX.—*Hæmodytes spicata*. 1. A flower spread open. 2. A small detached part of the ovary.

3. An anther.



by the number of their stamens, and by their anthers turning inwards, or, if their stamens are reduced to three, then, by those organs being opposite the petals; and by their simple stigma. Dr. Herbert includes all the hexandrous genera in Amaryllids; and limits the Order to those having 3 stamens and an adherent ovary; but, although it may be very difficult to express in satisfactory language the exact differences between the Blood-roots and Amaryllids, yet I think there can be no doubt of their real distinctness, and that the diagnosis now assigned to them does sufficiently characterize them.

In Brazil, Southern Guiana, and also in the Mascaren islands, there occurs a race of these plants which may be compared to the Conestyles of New Holland on a gigantic scale. Martius, who calls them Vellozias, describes them as perennial Lilies, with



Fig. C.

their trunks closely covered by the withered remains of leaves, branching by forks, and bearing at their points tufts of leaves in the manner of a *Yucca* or *Dracæna*; some of them are from 2 to 10 feet high, with a trunk sometimes as thick as a man's body. I find the structure of that trunk most curious. It consists of a central slender subcylindrical column, which never increases in diameter after its first formation, and which has the ordinary monocotyledonous structure. Outside of the column are arranged great quantities of slender fibrous roots, which cohere firmly by their own cellular surface, and form a spurious kind of wood, which is extremely like that of some kinds of Palm wood, only it is developed by constant additions to the very outside of the stem. Something analogous occurs in *Pandanus*, but it is in some tree ferns only that this mode of growth is exactly repeated. Don proposed to make an Order of the Vellozias; but till their structure and that of the Bloodroots shall have been thoroughly investigated this step is premature.

As to *Wachendorfia* and its allies, with triandrous flowers, and free ovary, Mr. Herbert looks upon it as the type of an Order (*Wachendorfiaceæ*) quite unconnected with *Hæmodorum* and *Conostylis*, and he is possibly right; but in the meanwhile, as we

know very little of these genera, it seems most expedient to dismiss them from the Blood-roots and station them in reserve among the Lilies. Endlicher states that the genera of this Order have the cells of the ovary opposite the petals, and this, if so, would certainly be an important characteristic; but I cannot confirm the statement: it is in truth very difficult to determine such a point in the majority of the genera, whose sepals and petals are all apparently on the same plane. The true *Hæmodoraceæ* are smooth and dissimilar in habit to *Conostylis* and its allies; wherefore a couple of additional sub-Orders may be conveniently admitted here, for which better characters may be hereafter found.

The species occur in North America sparingly, and the Cape of Good Hope; several are described from the more temperate parts of New Holland, and a good many Vellozias and Barbacénias occur in Brazil and the Mascaren islands. A Barbacenia (*Alexandrinæ*) growing from 10 to 12 feet high has also been noticed by Sir R. Schomburgk in the Southern parts of British Guiana.

De Candolle remarks, that the red colour found in the roots of *Lachnanthes tinctoria* in North America, where it is used for dyeing, prevails in *Hæmodorum*, and deserves to be studied in the rest of the Order. The natives of the Swan River live on the roots of such plants, especially of *Hæmodorum paniculatum* and spicatum, and *Anigozanthus floridus*, which are mild and nutritious when roasted, but acrid when raw. *Hook. Journ.* 2. 355. One of the most intense bitters known is *Aletris farinosa*. It is used in infusion as a tonic and stomachic, but large doses produce nausea and tendency to vomit. It has also been employed in chronic rheumatism.



## GENERA.

I.—*Hemodorum*. Perianth smooth,  
short.  
*Hemodorum*, Nutt.  
*Phacelanthus*, R. Br.  
II.—*Conoclinium*. Perianth woolly,  
long.  
*Dianthus*, Bong.  
*Lactucastrum*, D. Don.  
*Dasylirion*, Griseb.  
*Oxypleura*, Scaev.

*Isomeris*, Thunb.  
*Andropogon*, Jacq.  
*Agrostis*, Kunth.  
*Andropogon*, Kunth.  
*Andropogon*, Salisb.  
*Andropogon*, R. Br.  
*Andropogon*, R. Br.  
*Andropogon*, R. Br.  
*Andropogon*, R. Br.  
*Andropogon*, R. Br.

*Andropogon*, R. Br.  
*Andropogon*, R. Br.  
III.—*Conoclinium*.  
*Conoclinium*, D. Don.  
*Conoclinium*, D. Don.  
*Conoclinium*, R. Br.  
*Conoclinium*, R. Br.  
*Conoclinium*, R. Br.

Numerous. GEN. 13. Sp. 50.

*Liliaceæ.*

POSITION.—IRIDACEÆ.—HEMODORACEÆ.—*Andropogon*.

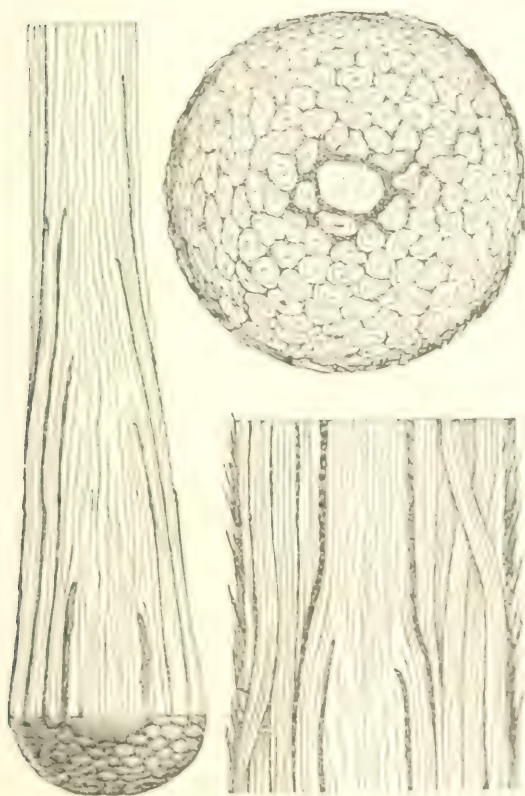


Fig. 11.

Fig. 11.—Sections of the stem of a *Bromus*. (Vascular bundles) & *Andropogon*.



## ORDER XLV. HYPOXIDACEÆ.—HYPOXIDS.

Hypoxidæ, *R. Br. in Flinders* (1814); *Agardh Aph.* 164 (1823); *Ed. prima. No.* 235 (1830); *Endl. Gen. lxxiii. Meisner, p.* 397.

DIAGNOSIS.—*Narcissal Endogens with hexapetaloidous flowers which are much imbricated, 6 stamens with anthers turned inwards, and a radicle remote from the hilum, which is often strophiole.*

Herbaceous plants with a tuberous or fibrous perennial root. Leaves always growing from the root and crown, nowhere else, linear, entire, plaited, of a dry texture. Scapes simple or branched, occasionally very short. Flowers complete, ♂. Perianth petaloid, adherent to the ovary, 6-parted, with the sepals coarser than the petals. Stamens 6, inserted into the base of the segments of the perianth; filaments distinct; anthers turned inwards, 2-celled, erect, opening lengthwise. Ovary adherent, 3-celled, with the cells opposite the sepals; style terminal, simple; stigmas distinct or combined, [crowned by an operculum formed by the base of the style.—*Herbert*]; ovules 00, axile, amphitropal. Fruit indehiscent, dry or berried, 1- 2- 3-celled; seeds 00, roundish, with a lateral hilum, and a beaked strophiole. Embryo in the axis of fleshy albumen, straight, with the radicle remote from the hilum, and directed upwards.



FIG. CII.

As far as habit goes, these are very different from the Amaryllids, for their leaves are harsh and hairy, and although dwarf, they have no bulbs. But when we look to the fructification there is but little to connect with the difference in the vegetation. It is true that the sepals are much coarser in texture than the petals, but that is of small importance; and in truth it is the position of the embryo, remote from the hilum, and that alone, by which the Order is to be certainly known; for the beaked strophiole, which is often found near the hilum, is of small importance. As to the texture of the seed-skin, formerly relied upon in distinguishing some of the Orders of

Endogens, experience and reason equally reject it as an ordinal character.

The whole number of Hypoxids is inconsiderable. What are known inhabit the Cape of Good Hope, New Holland, the East Indies, the tropics of America, and the warmer parts of the United States.

The roots of *Curculigo orchioideis* are somewhat bitter and aromatic, and are employed in the East Indies in gonorrhœa. The tubers of *Curculigo stans* are eaten in the Marianne islands; those of *Hypoxis erecta* are employed by the aborigines of North America in healing ulcers, and against intermittents.

GENERA.

*Curculigo*, *Gertn.*  
*Molinieria*, *Colla.*  
*Forbesia*, *Eckl.*

*Hypoxis*, *L.*  
*Schnitzleinia*, *Steud.*

*Niobeæ*, *W.*  
*Pauridia*, *Harv.*

NUMBERS. GEN. 4. Sp. 60.

*Orchidaceæ.*

POSITION.—*Hamodoraceæ.*—HYPOXIDACEÆ.—*Amaryllidaceæ.*

*Apostasiaceæ.*

Fig. CII.—1. Seed of *Curculigo orchioideis*; 2. a perpendicular section of it —*Gertner.*







and those stamens that actually develop. Hence a curious instance is exhibited, to which several parallels may, however, be found in other families, of the force of development being generally confined to a series of organs originating within those which should be formed according to the ordinary laws of structure. Of course, in all such Orders a multiplication of the usual number of stamens is more to be expected than where this peculiar circumstance does not exist.

The learned investigator of the Order, the Honourable and very Rev. W. Herbert, Dean of Manchester, includes in it the whole Narcissal Alliance, to which he adds the Yams; for his reasons for which the reader is referred to the elaborate monograph above quoted. The remarkable difference in habit between the bulbous species, like *Narcissus*, and the arborescent kinds, such as *Agave* and *Littæa*, is precisely analogous to what occurs among the Lilies, and does not appear to be connected with differences in the fructification. Dr. Joseph Hooker is of opinion that Brown is right in regarding *Campynema* as belonging to *Melanthus*; but its inferior ovary is against this view, notwithstanding its separate styles. It is probably an osculant genus.

A very few only are found in the North of Europe and the same parallel; these are plants of the genera *Narcissus* and *Galanthus*. As we proceed south they increase. *Pancratium* appears on the shores of the Mediterranean; *Crinum* and *Pancratiums* abound in the West and East Indies; *Hæmanthus* is found for the first time with some of the latter on the Gold Coast; *Hippeastrum* show themselves in countless numbers in Brazil, and across the whole continent of South America; and, finally, at the Cape of Good Hope the maximum of the Order is beheld in all the beauty of *Hæmanthus*, *Crinum*, *Clivia*, *Cyrtanthus*, and *Brunsvigia*. A few are found in New Holland, the most remarkable of which is *Doryanthes*.

This is one of the few monocotyledonous Orders in which poisonous properties occur. They are principally apparent in the viscid juice of the bulbs of *Hæmanthus toxicarius* and some neighbouring species, in which the Hottentots are said to dip their arrow-heads, and *Amaryllis Belladonna*, which is said to be employed for poisoning in the West Indies, (*Endl.*); but this is no doubt a mistake, and the statement applies to some other bulbs of the Order—for the *Belladonna* is a Cape plant; probably to *Hippeastrum*, which Martius tells us have poisonous bulbs. The bulbs of *Leucoium vernum*, of the Snowdrop and Daffodil, have for ages been known as emetic; and it has recently been shown by Loiseleur Deslongchamps that a similar power exists in *Narcissus Tazzetta*, *odorus* and *Poeticus*, and in *Pancratium maritimum*.

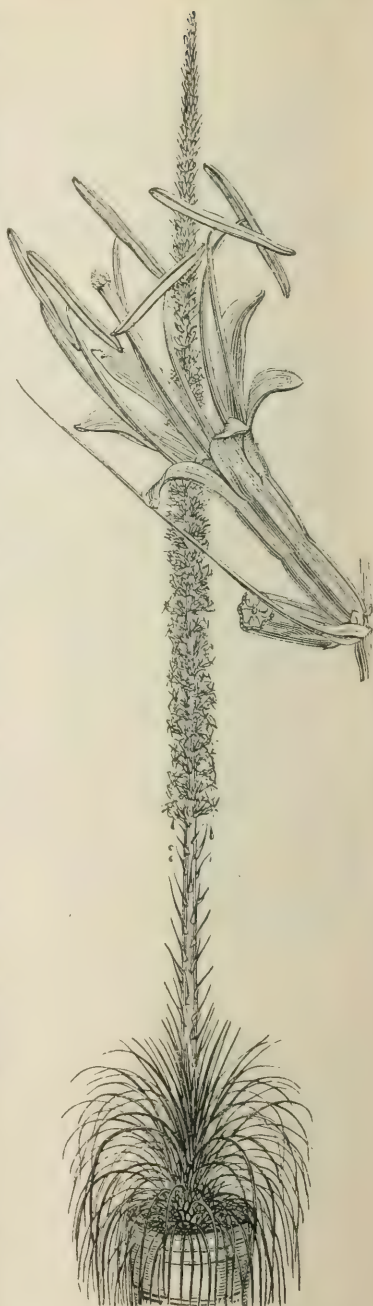


Fig. CV.



The flowers of *Narcissus* *Pseudo-Narcissus* are not only emetic, but a dangerous poison, occasionally producing serious consequences in infants which are allowed to swallow them. DeCandolle considers the principle found in *Amaryllids* analogous to that of the *Squill* (*Lin.*, p. 250). *Oporanthus luteus* is purgative, *Alstromeria salsilla* diaphoretic and diuretic, *Amaryllis ornata* astringent. *Agave* *Aph.* 174. A kind of arrow-root is prepared from the succulent roots of *Alstromeria pallida* and others, in Chile. *Bomarea Salsilla* is employed as a substitute for *Sarsaparilla*. *Agave Americana*, the American Aloe, which is said to flower once only in a hundred years, a gardener's fable, forms impenetrable hedges with its hard and spiny leaves; its fibre and that of some neighbouring species, especially the *Pita* plant, is extremely tough, and forms excellent cordage; its root is diuretic and antisyphilitic, and is even brought to Europe mixed with *Sarsaparilla*. "The species of *Agave* are not alone ornamental as plants and useful as hedges, but are important for their products. The roots, as well as the leaves, contain ligneous fibre (pita thread), useful for various purposes: this is separated by bruising and steeping in water, and afterwards beating. The Mexicans also made their paper of the fibres of *Agave* leaves laid in layers. The expressed juice of the leaves evaporated, is stated by Long, in his Hist. of Jamaica, to be also useful as a substitute for soap.

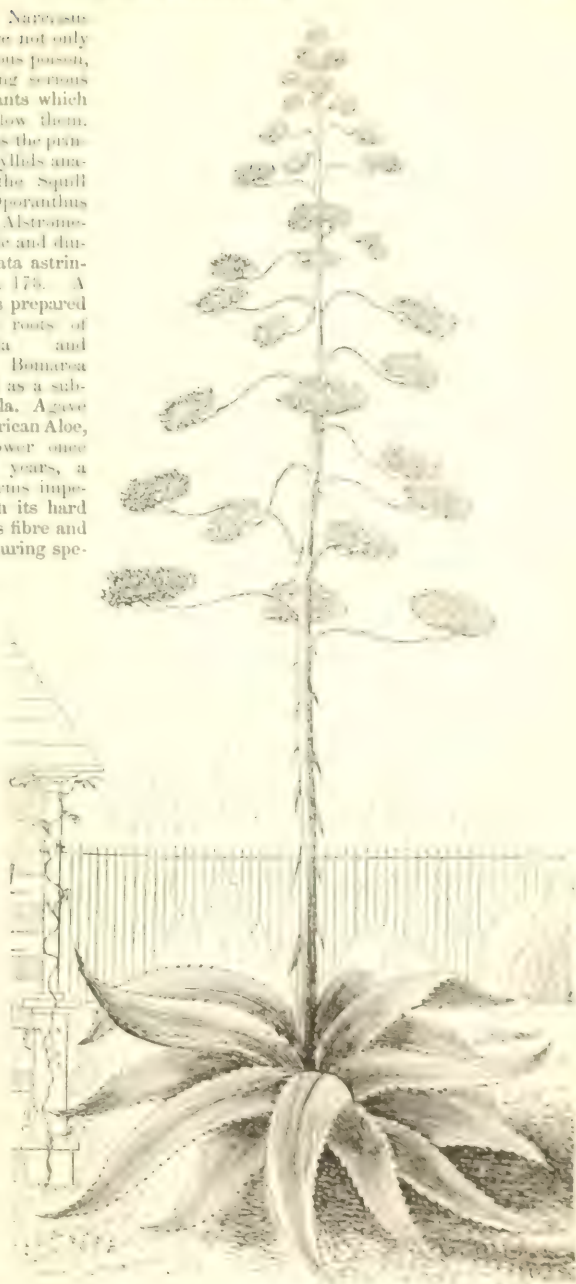


PLATE I.



But the most important product of Agave, and especially of *A. Americana*, the species now most common in the South of Europe, is the sap, which exudes upon the cutting out of the inner leaves, just before the flower-scape is ready to burst forth. Of this a very full account is given by Humboldt, in his Political History of New Spain, book iv. c. 9. The species is *A. Americana*, called metl by the Mexicans, and Maguay de Cociuza in Caraccas. Pittes and maguey-metl are varieties of *A. Americana*, which is stated to be common everywhere in Equinoctial America, from the plains even to elevations of between 9000 and 10,000 feet. *A. Mexicana* is also, by some authors, called maguei-metl, and also manguai; and *A. Vivipara* is theometl or maguei divinum. In Cumana and Caraccas, *A. Cubensis* is called maguey de Cocay. Humboldt informs us, that the first (*A. Mexicana*) is extensively cultivated in the interior table-land of Mexico, and, indeed, extends as far as the Aztec language. The juice of the Agave is of a very agreeable sour taste. It easily ferments on account of the mucilage and sugar it contains, when it is called pulque by the Spaniards. This vinous beverage, which resembles cider, has an odour of putrid meat, extremely disagreeable; but the Europeans, who have been able to get over the aversion which this fetid odour inspires, prefer the pulque to every other liquor. A very intoxicating brandy is formed from the pulque, which is called mexical or aguardiente de maguey. The government drew from the Agave juice a net revenue of £166,497 in three cities."—*Royle*. Agave saponaria is a powerful detergent; its roots are employed in Mexico as a substitute for soap. A cold infusion of the leaves of *Chæradodia Chilensis* is purgative and diuretic; it is called Thekel, in Chile.—*Molina*.

# GENERA.

Tribe I. — Amaryllææ.	<i>Amaryllis</i> , Sweet.	<i>Liperiza</i> , Herb.	<i>Ganymedes</i> , Haw.
<i>Bulbs, without a cor- onet in the flower.</i>	<i>Coburgia</i> , Herb.	<i>Calliphurria</i> , Herb.	<i>Philogyne</i> , Haw.
	<i>Leopoldia</i> , Herb.	<i>Eurycles</i> , Salisb.	<i>Hermione</i> , Haw.
<i>Galanthus</i> , Linn.	<i>Vallota</i> , Herb.	<i>Proiphys</i> , Herb.	<i>α. Jonquillia</i> , DC.
<i>? Erangelia</i> , Renealm.	<i>Lycoris</i> , Herb.	<i>Calostemma</i> , R. Br.	<i>β. Tazetta</i> , DC.
<i>Leucojum</i> , Linn.	<i>Strumaria</i> , Jacq.	<i>Vagaria</i> , Herb.	<i>Chloraster</i> , Haw.
<i>Nivearia</i> , Mönch.	<i>Hesaea</i> , Herb.	<i>Tapeinanthus</i> , Herb.	<i>Corbularia</i> , Haw.
<i>Acis</i> , Salisb.	<i>Nerine</i> , Herb.	<i>Chlidanthus</i> , Herb.	
<i>Erinosma</i> , Herb.	<i>Galathea</i> , Herb.	<i>Clinanthus</i> , Herb.	
<i>Lapiedra</i> , Lagasc.	<i>Brunsvigia</i> , Heister.	<i>Urceolina</i> , Rchb.	Tribe III. — Alströmérieæ.
<i>Carpolyza</i> , Salisb.	<i>Imhofia</i> , Herb.	<i>Urceolaria</i> , Herb.	<i>Fibrous rooted. Sepals different in form from the petals.</i>
<i>Hesaea</i> , Berg.	<i>Buphane</i> , Herb.	<i>Collania</i> , Schultz.	
<i>Gethyllis</i> , L.	<i>Boophane</i> , Herb.	<i>Coburgia</i> , Sweet.	<i>Chæradodia</i> , Herb.
<i>Papiria</i> , Thunb.	<i>Ammocharis</i> , Herb.	<i>Phædranassa</i> , Herb.	<i>Alströméria</i> , L.
<i>Ixiolirion</i> , Fisch.	<i>Griffinia</i> , Ker.	<i>Stenomesson</i> , Herb.	<i>Collania</i> , Herb.
<i>Bravoa</i> , Llav.	<i>Crinum</i> , Linn.	<i>Chrysiphiale</i> , Ker.	<i>Sphærine</i> , Herb.
<i>Cetocapnia</i> , Lk. et Otto.	<i>Hæmanthus</i> , Linn.	<i>Sphærotele</i> , Presl.	<i>Bomarea</i> , Mirb.
<i>Sternbergia</i> , Waldst. et Kit.	<i>Tristegia</i> , Rchb.	<i>Elisena</i> , Herb.	
	<i>Polystegia</i> , Rchb.	<i>Liriope</i> , Herb.	
<i>Oporanthus</i> , Herb.	<i>Cyrtanthus</i> , Ait.	<i>Liriope</i> , Rchb.	Tribe IV. — Agavææ.
<i>Haylockia</i> , Herb.	<i>Timmia</i> , Gmel.	<i>Pancratium</i> , Linn.	<i>Fibrous rooted. Sepals and petals alike.</i>
<i>Cooperia</i> , Herb.	<i>Cyrtanthus</i> , Herb.	<i>Hymenocallis</i> , Salisb.	
<i>Scopranthus</i> , Grah.	<i>Monella</i> , Herb.	<i>Schizostephanium</i> , Rchb.	<i>Clivia</i> , Lindl.
<i>Amaryllis</i> , Linn.	<i>Gastronema</i> , Herb.	<i>Halmyra</i> , Salisb.	<i>Imatophyllum</i> , Hook.
<i>Lilio-Narcissus</i> , Tour.	<i>Coleophyllum</i> , Klotsch.	<i>Tiaranthus</i> , Herb.	<i>Himantophyllum</i> , Spr.
<i>Belladonna</i> , Sweet.		<i>Choretis</i> , Herb.	<i>Campynema</i> , Labill.
<i>Cutlirhoe</i> , Link.	Tribe II. — Narcissææ.	<i>Ismene</i> , Herb.	<i>Campylonema</i> , Poir.
<i>Zephyranthes</i> , Herb.	<i>Bulbs, with a coronet in the flower</i>	<i>Callithaume</i> , Herb.	<i>Doryanthes</i> , Correa.
<i>Argyropsis</i> , Herb.		<i>Narcissus</i> , Linn.	<i>Agave</i> , L.
<i>Pyrolirion</i> , Herb.	<i>Phycella</i> , Lindl.	<i>Ajax</i> , Haw.	<i>Littæa</i> , Tagl.
<i>Habranthus</i> , Herb.	<i>Placea</i> , Miers.	<i>Diomedes</i> , Haw.	<i>Bonaparlea</i> , W.
<i>Sprekelia</i> , Hest.	<i>Eucrosia</i> , Ker.	<i>Queltia</i> , Haw.	<i>Fourcroya</i> , Vent.
<i>Hippeastrum</i> , Herb.	<i>Carpodetes</i> , Herb.	<i>Schizanthus</i> , Haw.	

NUMBERS. GEN. 68. Sp. 400.

*Melanthaceæ.*

POSITION.—Iridaceæ.—AMARYLLIDACEÆ.—Hypoxidaceæ.

*Liliaceæ.*

## ADDITIONAL GENUS.

*Rhodophiala*, Presl., perhaps *Phycella*.



## ORDER XLVII. IRIDACEÆ.—Iris.

*Iridos*, *Juss. Gen.* 37. (1789); *Endl. Gen.* 110. *Key to Amer. Nat. History*, 1: 216. (*Botan. de France*, 1805, p. 202. (1810); *Juss. Gen. Syst.*, 1: 27. (1817); *Boiss. Voy.*, 3: 46. (1828); *Mémoires*, p. 294. (1830); *Arboret. Fr.*, pr. cxxl.; *Endl. Gen.* lxi.)

**DIAGNOSIS.** *Narcissus* and 3 stems, opposite the leaves, and without axillary ones.

Herbaceous plants, or very seldom under shrubs, usually annual; the leaves, if there are any, simple. Roots tuberos or fibrous. Leaves opposite and distichous by some genera. Inflorescence terminal, in spikes, corymbs, or panicles, or crowded; sometimes radical. Bracts spathaceous, the partial ones often scarious; the sepals sometimes rather herbaceous. Calyx and corolla adherent or coherent, their divisions either partially cohering, or entirely separate; sometimes irregular, the 3 petals being occasionally very short. Stamens 3, arising from the base of the sepals; filaments distinct—connate; anthers bursting externally lengthwise, fixed by their base, 2-celled. Ovary 3-celled, cells many-seeded; ovules anatropal; style 1; stigmas 3, often petaloid, some-



FIG. CVII.



FIG. CIX.



FIG. CVIII.



FIG. CN.

times 2-lipped. Capsule 3-celled, 3-valved, with a hemispherical, lobed, scarious, sessile, attached to the inner angle of the cells, sometimes pericarpial, sometimes decurrent base.

FIG. CVII.—Dissection of an Iris.

FIG. CIX.—An Iris flower.

FIG. CN.—Dissection of a petal.

FIG. CN.—Anther of an Iris.



spheroidal, angular, oblong, or winged; albumen horny, or densely fleshy; embryo inclosed within it, the radicle being uniformly next the hilum.

This Order differs from that of Amaryllids essentially, in being triandrous, with the anthers turned outwards; from Orchids, to which it approaches nearly in some respects, in not being gynandrous; in the nature of the seeds and placenta, in all the anthers being distinct; from Gingers and Arrowroots the three perfect stamens divide it, independently of the structure of the leaves, which are extremely different. Blood-roots, which are often triandrous with equitant leaves, have the anthers bursting inwardly, and when triandrous their stamens are opposite the petals. The Iris represents the general structure of the Order; but a departure from the form of perianth found in that genus takes place in *Crocus*, the flower of which is extremely like that of *Gethyllis* and *Oporanthus* among Amaryllids on the one hand, and of *Colchicum* among Melanths on the other; the latter is known by their superior triple ovary. The dilated stigma found in *Iris* is characteristic of only a part of the Order; in *Crocus* the stigma is rolled up instead of being spread open, and in many genera it is absolutely thread-shaped. Brown observes, that *Burmannia* appears at first sight to agree with Irids, especially in its equitant leaves, coloured superior triandrous perianth, and 3 dilated stigmas; it cannot, however, be united with them, on

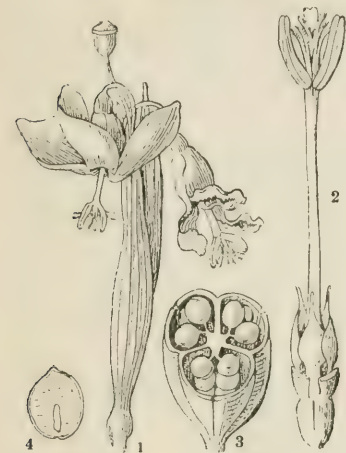


Fig. CXI.

account of its fertile stamens being opposite the inner segments of the perianth, and alternating with an equal number of sterile ones, because of the transverse dehiscence of the anthers, and also the structure of the seeds. In *Xyris* some resemblance with this Order is discoverable, especially in the disposition of the leaves, the triandrous flowers, and anthers turned outwards; but that genus is very distinct in its free perianth, the outer segments of which are glumaceous, and the inner distinctly petaloid, in the unguis bearing the stamens at their apex, in the sterile alternate stamens, and especially in the structure of the seed.—*Prodr.* 302. The whole Order is greatly in want of a good critical examination; but much caution is required in forming the genera, especially in deriving characters from the seeds, for they are both round, and fleshy, and thin, in the genus *Iris*.

The Irids are principally natives either of the Cape of Good Hope, or of the middle parts of North America and Europe. A few only are found within the tropics, and the Order is generally far from abundant in South America, if compared with the numbers that exist at the Cape. The genera *Marica* and *Moræa* appear to occupy the same station in hot climates that *Iris*, a closely related genus, does in cooler latitudes. *Crocus*, among the most conspicuous of the Order, occurs only in Europe and Asia. None of the Cape or New Holland forms appear in America.

More remarkable for their beautiful fugitive flowers than for their utility. The rhizome of some of them is slightly stimulating, as the violet-scented Orris root, the produce of *Iris Florentina*. Various species of *Sisyrinchium*, *Ferraria*, *Libertia*, and the *Iris*es *pseud-acorus*, *tuberosa*, *versicolor*, and *verna*, are used as diuretics, purgatives, and emetics, but some of them are apt to produce distressing nausea like sea-sickness, with a prostration of strength. The substance called Saffron is the dried stigmas of *Crocus sativus*; its colouring ingredient is a peculiar principle, to which the name *Polychroite* has been given; it possesses the properties of being totally destroyed by the action of the solar rays, of colouring in small quantity a large body of water, and of forming blue and green tints when treated with sulphuric and nitric acid, or with sulphate of iron. In moderate doses this substance stimulates the stomach, and in large quantities excites the vascular system. Moreover it seems to have a specific influence on the cerebro-spinal system, as it affects, it is said, the mental faculties, a result which De Candolle considers analogous to that produced by the petals of certain odorous flowers. "In modern practice it is little used, except as a colouring ingredient; on the Continent it is employed

Fig. CXI.—1. Spathe and flowers of *Rigidella immaculata*; 2. the petals, stamens, &c. of it; 3. a cross section of the capsule of *Pardanthus Chinensis*; 4. a perpendicular section of its seeds.



as an agreeable stimulant in many culinary preparations and liquors. In a medicinal point of view it is frequently used to assist the eruption of cutaneous eruptions; on the same principle that bird fanciers give it to birds in the moult. It has been called by a carminative, antispasmodic and emmenagogue."—*Persica*, Sicilian saffron is obtained from *Crocus odoratus*, according to Gussone. According to Virey, the ground roots of *Iris pseud-acorus* very nearly approach Coffee in quality.—*Suppl. Pharmac.* 237. The *colerus* is regarded as an antisiphilitic; *Iris antichissima*, the *lily of Damascus*, has some reputation as a cure for scrofula. *Gladiolus segetum* has been fancied an aphrodisiac, a reputation doubtless obtained from its acrid qualities, which seem to occur in the whole Order, as far as they have been examined. Nevertheless, we are told that the *Hyacinthus* eat the tubers or corns of various species, whose starch renders them nutritious. Those of *Trichonema edule* are eaten by the natives of Socotra, as we learn from Welwood. According to Eudlicher, the purple flowers of *Iris germanica* and *sibirica*, treated with lime, furnish a green colour (Liliengrün), "much used by artists." The stem of *Wittania maura* is said to abound in rich saccharine juice.—*Bot. Res.* 1. 5. Some *Primula* roots are purgative, among which Martius particularly enumerates *Fernaria purpurea* and *cathartica*, and *Sisyrinchium galaxioides*.

## GENERA.

<i>Sisyrinchium</i> , L.	<i>Moraea</i> , L.	<i>Trichonema</i> , Commers.	<i>Wittania</i> , L.
<i>Bomarea</i> , Tourn.	<i>Homocidus</i> , Vent.	<i>Pterostris</i> , R. Br.	<i>Synedra</i> , R. Br.
<i>Saccharinella</i> , Wilmes.	<i>Homocidus</i> , Salisb.	<i>Homocidus</i> , Labell.	<i>Macrostoma</i> , J. R.
<i>Orthocentrus</i> , Swach.	<i>Diplarrhina</i> , Labell.	<i>Galaxia</i> , Thunb.	<i>Homocidus</i> , Vent.
<i>Solenostylis</i> , Murr.	<i>Iris</i> , L.	<i>Ovisia</i> , Spreng.	<i>Trichonema</i> , K.
<i>Crocodactylus</i> , Miers.	<i>Alchemilla</i> , Tournet.	<i>Capitata</i> , Poir.	<i>Wittania</i> , R. Br.
<i>Symphostemon</i> , Miers.	<i>Hermodactylus</i> , Tourn.	<i>Polystylis</i> , Sweet.	<i>Homocidus</i> , R. Br.
<i>Eleutherina</i> , Herb.	<i>Sisyrinchium</i> , Tourn.	<i>Macrostoma</i> , Dietr.	<i>Trichonema</i> , K.
<i>Psyllerisma</i> , Herb.	<i>Iris</i> , Tratt.	<i>Avonastylis</i> , Ker.	<i>Trichonema</i> , R. Br.
<i>Echthronema</i> , Herb.	<i>Herbertia</i> , Swach.	<i>Avonastylis</i> , Lawson.	<i>Macrostoma</i> , K.
<i>Eriphilema</i> , Herb.	<i>Cypella</i> , Herb.	<i>Balanis</i> , Ker.	<i>Trichonema</i> , K.
<i>Calydorea</i> , Herb.	<i>Phalocallis</i> , Herb.	<i>Avonastylis</i> , Salisb.	<i>Trichonema</i> , Salisb.
<i>Giumosia</i> , Herb.	<i>Alphina</i> , Herb.	<i>Avonastylis</i> , Herb.	<i>Trichonema</i> , Salisb.
<i>Tosophilaea</i> , Bert.	<i>Tritunaria</i> , Herb.	<i>Gladiolus</i> , Tournef.	<i>Trichonema</i> , Salisb.
<i>Phyganeus</i> , Popp.	<i>Hydrostoma</i> , Lindl.	<i>Hyacinthus</i> , Pers.	<i>Trichonema</i> , Salisb.
<i>Phyganeus</i> , Kunze.	<i>Beatania</i> , Herb.	<i>Homocidus</i> , Salisb.	<i>Trichonema</i> , Salisb.
<i>Libertia</i> , Spr.	<i>Fierdia</i> , Juss.	<i>Synedra</i> , Sweet.	<i>Trichonema</i> , Salisb.
<i>Renealmia</i> , R. Br.	<i>Rigidella</i> , Lindl.	<i>Synedra</i> , Sweet.	<i>Trichonema</i> , Salisb.
<i>Nemastylis</i> , Dietr.	<i>Ferraria</i> , Linn.	<i>Synedra</i> , Sweet.	<i>Trichonema</i> , Salisb.
<i>Cipura</i> , Aubl.	<i>Pardalium</i> , Ker.	<i>Synedra</i> , Sweet.	<i>Trichonema</i> , Salisb.
<i>Moraea</i> , Schreb.	<i>Belamcanda</i> , Rhoebo.	<i>Antholyza</i> , Linn.	<i>Trichonema</i> , Salisb.
<i>Trichonema</i> , Salisb.	<i>Aristea</i> , Soland.	<i>Cunonia</i> , Buttn.	<i>Trichonema</i> , Salisb.
<i>Hydrostoma</i> , Salisb.	<i>Chetia</i> , Salisb.	<i>Agrostis</i> , Sweet.	<i>Trichonema</i> , Salisb.
<i>Giumosia</i> , Salisb.	<i>Belamcanda</i> , Linn.	<i>Pterostris</i> , Salisb.	<i>Trichonema</i> , Salisb.
<i>Homocidus</i> , Herb.	<i>Wredocia</i> , Eckl.	<i>Watsonia</i> , Mill.	<i>Trichonema</i> , Salisb.
<i>Viassaria</i> , R. Br.	<i>Wittania</i> , Thunb.	<i>Micranthus</i> , Pers.	<i>Trichonema</i> , Salisb.
<i>Phytolacca</i> , Eckl.	<i>Nitella</i> , Vent.	<i>Phytolacca</i> , Houtt.	<i>Trichonema</i> , Salisb.
<i>Phytolacca</i> , Herb.	<i>Giumosia</i> , R. Br.	<i>Merina</i> , Trev.	<i>Trichonema</i> , Salisb.
<i>Trimezia</i> , Herbert.	<i>Sophronia</i> , Lichtenst.		

NUMBERS. GEN. 53. Sp. 550.

## Orchidaceæ.

POSITION. Hamodoraceæ. IRIDACEÆ.—Anaphalaceæ.

## ADDITIONAL GENERA.

<i>Eustylis</i> , A. Gray, near <i>Nemastylis</i> .	<i>Chetia</i> , Thunb. near <i>Trichonema</i> .
<i>Lansbergia</i> , de Fries, near <i>Cypella</i> .	<i>Phytolacca</i> , Thunb. near <i>Trichonema</i> .
<i>Distrepta</i> , Miers. = <i>Phytolacca</i> .	



## ALLIANCE XII. AMOMALES.—THE AMOMAL ALLIANCE.

DIAGNOSIS.—*Epigynous petaloid Endogens, with unsymmetrical flowers, from 1 to 5 stamens, some of which are abortive, and albuminous seeds.*

In the Narcissal Alliance, the series was terminated by the Irids, many of whose genera have a singularly irregular corolla : as, for example, *Babiana* ; there was, however, even in these last, an exact symmetry in the number of parts of which the flowers consist. In this Alliance that symmetry is wholly lost, the number of perfect stamens, as represented by anthers, being reduced to one, or even half a one, and not exceeding five in any instance. At the same time the development of the foliage takes a new direction. In the majority of Narcissals the leaves are absolutely sword-shaped, and their veins consequently run in parallel lines ; and even when, as sometimes happens, their leaves become widened, the veins still converge at the point. But in the Amomal Alliance the veins always diverge ; the result of which is a foliage of quite another character, to which, among Endogens, some Lilyworts offer the only resemblance. When such leaves acquire a large size, they are frequently split into lateral ribands.

### NATURAL ORDERS OF AMOMALS.

<i>Stamens more than 1 ; (anthers 2-celled, no vitellus)</i> . . . . .	48. MUSACEÆ.
<i>Stamen but 1 ; anther 2-celled, embryo in a vitellus</i> . . . . .	49. ZINGIBERACEÆ.
<i>Stamen but 1 ; anther 1-celled (halved), no vitellus</i> . . . . .	50. MARANTACEÆ.

For original observations upon the development of these plants the reader is referred to Crüger in Henfrey and Huxley's *Scientific Memoirs*, vol. i. p. 155.



## ORDER XLVIII. MUSACEÆ.—MUSARDS.

Musci, *Jour. Gen.* 1789 = Meyerov, *Ann. Bot. Appl.* 1891, 1921. — *Ann. Bot. Soc. Belg.* 1914, 1915, 1918. — *Le Jardinier Pr. Br. F. Neuf. ed.* 1899, *Le Jardin. Gen.* 1899, *Le Jardinier* 1906, 1907, 1908, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918. — Meyerov, p. 189.

DIAGNOSIS: *A. fumigatus* and *E. coli* with *Aspergillus* spp.

Stemless or nearly stemless plants, with leaves sheathing at the base, and forming a kind of spurious stem, often very large, their limb separated from the tapetum by a round tumour, and having fine parallel veins diverging regularly from the midrib towards the margin. Flowers spathaceous. Perianth 6-parted, adherent, petaloid, in 2 distinct rows, more or less irregular. Stamens 6, inserted upon the middle of the divisions, some always becoming abortive; anthers linear, turned inwards, 2-celled, often having a membranous petaloid crest. Ovary inferior, 3-celled, many-seeded, rarely 3-seeded; ovules anatropal; style simple; stigma usually 3-lobed. Fruit either a 3-celled capsule, with a loculicidal dehiscence, or succulent and indehiscent. Seeds sometimes surrounded by hairs, with an integument which is usually crustaceous; embryo orthotropal, oblong-linear, or mushroom-shaped, with the radicular end touching the hilum, having pierced through the mealy albumen.

The relationship of this Order will be pointed out under Gingerworts and Marants, with which the Musads are strictly related. The flower of *Musa* is well described in the Appendix to the *Congo Expedition*, 171., in a note; that of *Strelitzia* is pentandrous and exceedingly irregular, and is admirably illustrated in Bauer's drawings, published some years since by Ker, under the title of *Strelitzia Deppea*. The hilum of the seed gives rise to a tuft of long hairs in *Strelitzia* and *Musa*. For remarks upon the distinctive characters of some of the genera of Musads, see *Endl. Prodr.* p. 34, and *Isotriaenoides* in the place above quoted. *Musa* are doubtless the most perfect of the Animal Alliance, excelling the others both in the size at which they arrive, and the completeness of their parts of fructification.

Natives of the Cape of Good Hope, the islands of its south-east coast, and generally of the plains of the tropics, beyond which they do not naturally extend, arbores in degree, the climate of which seems to be much at variance with that of other countries in the same latitude.

They are most valuable plants, both for the abundance of nutritive food afforded by their fruit, called in the tropics Plantains and Bananas, and for the many domestic purposes to which the gigantic leaves of some species are applied. The latter are used for thatching Indian cottages, for a natural cloth from which the travellers make out their food, as a material for basket making, and finally they yield a most valuable fibre (*Musa textilis*), from which some of the finest muslins of India are prepared. The stems are formed of the united petioles of the leaves, which are remarkable for the extraordinary number of spiral vessels they contain: these exist in such numbers as to be capable of being pulled out by handfults, and are said to be collected in the West Indies and sold as a kind of tinder.—*Ibid.* Orig. 36. The number of threads in each concatenation of these spiral vessels varies from 7 to 22. *Ibid.* 37. The young shoots of the Banana are eaten as a delicate vegetable. The root of Heliconia, a tree of the same family as the Bihai, and the seed of *Urania speciosa* or Raveolata, a tree of the same family also, called by the French *Arbre du Papegar*, are said to be capable of supplying with oil the



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Fig. CXII - *Mus mus* (Linn.), growth apparatus of young adults.



most brilliant blue colour, yields an essential oil. The juice of the fruit and the lymph of the stem of *Musa* are slightly astringent and diaphoretic. The juice of the fruit of *Urania* is used for dyeing.—*Agdh.*

GENERA.

- |  |   |   |
|--|---|---|
| I.— <i>Heliconææ</i> . Seeds solitary.           | II.— <i>Uranææ</i> . Seeds numerous                                       | <i>Strelitzia</i> , Banks.  |
| Fruit a capsule bursting through the partitions. | in each cell. Fruit berried, or, if capsular, bursting through the cells. | <i>Heliconia</i> , Gartn.<br><i>Ravenala</i> , Adans.<br><i>Urania</i> , Schreb.<br><i>Phenacospermum</i> , Endl. |
| <i>Heliconia</i> , Linn.<br><i>Bihai</i> , Plum. | <i>Musa</i> , Tournef.  |   |

NUMBERS. GEN. 4. Sp. 20.

POSITION.—*Zingiberaceæ*.—*Liliacææ*.—*MUSACEÆ*.—*Marantaceæ*.  
*Palmaceæ*!



Fig. CXII. bis.

Fig. CXII. bis. Part of the inflorescence of *Heliconia angustifolia*; a, stamens and pistil, the surrounding parts being removed.—after Hooker.



## ORDER XLIX. ZINGIBERACEÆ. Gen. 5. Sp. 1.

[illegible]

DIAGNOSIS. A normal *Entolagus* with an intense, a well-defined, and a well-defined the coloration.

Aromatic tropical herbaceous plants. Rhizome creeping, often jointed. Stem turned  
of the coloring bases of the leaves, never branching. Leaves simple, sheathing, thin



Fig. 6. XIII.

lamina often separated from the sheath by a taper neck, and having a single midrib, from which very numerous, simple, crowded veins diverge at an acute angle. Leaves either a dense spike, or a raceme, or a sort of panicle, terminal or pedicel. Flowers arising from among spatheaceous membranous bracts, in which they usually lie before Calyx superior, tubular, 3-lobed, short. Corolla tubular, irregular, with 6 segments in 2 whorls; the outer 3-parted, nearly equal, or with the odd segment sometimes differently shaped; the inner (sterile stamens) 3-parted, with the intermediate segment (labellum) larger than the rest, and often 3-lobed, the lateral segments sometimes nearly abortive. Stamens 3, distinct, of which the 2 lateral are abortive, and the intermediate one fertile; this placed opposite the labellum, and arising from the base of the intermediate segment of the outer series of the corolla. Filament not persistent, often extended beyond the anther in the shape of a lobed or entire appendage. Anther 2-celled, opening longitudinally, its lobes often embracing the upper part of the style. Pollen globose, smooth. Ovary 3-celled, sometimes tripartitely 3-angled, seated anatropal, attached to a placenta in the axis; style filiform, stigma lobed, 3-angled. Fruit usually capsular, 3-celled, many-seeded, [sometimes by abortion 1-celled], generally 3-berried (the dissepiments generally central, proceeding from the axis of the ovary. At last usually separate from the latter, and of a different texture. In dry seasons roughish, or angular, with or without an aril (allium fleshy, its surface becoming dry and brittle) persistent near the hilum. R. 2c5; embryo inclines 1 with a perispermous nutlet. (1845)

FIG. CNIII.—1. Flowers of *Kalmia latifolia*; 2, the lower part of the ovary, covered by bristles; 3, the anther, enclosing the apex of the style; 4, a transverse section of the ovary; 5, a transverse section of the ovary; 6, a transverse section of the ovary; 7, a seed; 8, the lower part of the ovary; 9, the ovary, covered by bristles.



*R. Br. Prodr.*; membrane of the amnios, *Ibid. in King's Voyage*, 21), with which it does not cohere.

Formerly the Gingerworts and Marants were united in one tribe called *Cannæ*: hence it is certain that they are at least more nearly related to each other than to anything else, and that whatever is the affinity of the one will be that of the other. Taking the vegetation into account, these two tribes are exceedingly nearly allied to Musads, in which is found the same kind of leaf, the veins of which are closely set, and diverge from the midrib to the margin, being connected by very weak and imperfect intermediate veins; the leaves have also the same distinct petiole, often with a thickened rounded space at the apex; Musads are, however, pent- or hexandrous, with a calyx and corolla of the same texture. Irids are the next Order with which Gingerworts may be compared, agreeing in their superior flowers, which have sometimes an approach to the irregularity of *Alpinia*, and also in the triple number of their stamens; but while these organs are all developed in Irids, two are abortive or deformed in Gingerworts and Marants. Bromelworts have been identified with them of old, but their resemblance consists chiefly in the distinction of calyx and corolla, and their inferior ovary. To Orchids, to which the flowers of *Mantisia* bear much resemblance, they are related in consequence of the reduction of their three stamens to one by the abortion of two: but the cohesion of the stamens and style in the latter, and the want of any distinction between calyx and corolla, sufficiently separate them, besides which the series which produces the stamens in Orchids answers to the sterile stamens or inner limb of the corolla in the Gingerworts. There is a volume consecrated to plants of this kind by Roscoe, who first remodelled the genera and reduced them within fixed limits. Between the embryo and the albumen is interposed a fleshy body enveloping the former: this has been called a process of the rostellum by Correa, a cotyledon by Smith, a vitellus by Gärtner and Brown, a central indurated portion of the albumen by Richard. It is now known to be the innermost integument of the ovule, unabsorbed during the advance of this body to maturity.

Independently of the presence of this vitellus, the most remarkable part of the structure of Gingerworts depends on the number of divisions of the floral envelopes, which consist of a tubular calyx, and of two more series instead of one. Brown, struck with this unusual deviation from the ordinary organization of Monocotyledons, was disposed to consider the calyx an accessory part (*Prodr.* 305); but Lestiboudois' explanation appears more satisfactory. According to this botanist Gingerworts are really hexandrous, like the nearly-related Musads; but of their stamens the outer series is petaloid, and forms the inner limb of the corolla, and of the inner series of stamens the central one only develops, the lateral ones appearing in the form of rudimentary scales. This notion of Lestiboudois is confirmed by Marants, in which the inner stamens (even that which is antheriferous) become petaloid like the outer: thus showing that in these plants there is a strong and general tendency in the filaments to assume the state of petals.

All are tropical, or nearly so. By far the greater number inhabit various parts of the East Indies; some are found in Africa, and a few in America. They form a part of the singular Flora of Japan.

They are generally objects of great beauty, either on account of the high development of the floral envelopes, as in *Hedychium coronarium* and *Alpinia nutans*; or because of the rich and glowing colours of the bracts, as in *Curcuma Roscoeana*. They are, however, principally valued for the sake of the aromatic stimulating properties of the root or rhizome, such as are found in Ginger (*Zingiber officinale*), Galangale (*Alpinia racemosa* and *Galanga*), Zedoary (*Curcuma Zedoaria* and *Zerumbet*), and some other species of the latter genus. Many more species are used in a similar manner. The warm and pungent roots of the greater and lesser Galangale are not only used by the Indian doctors in cases of dyspepsia, but are also considered useful in



Fig. CXIV.

Fig. CXIV.—A flower of *Mantisia saltatoria*; 1. style, stigma, and anther; 2. ovary, style, and abortive stamens.



coughs, given in infusion. A bad sort of Galangale is obtained from *Alpinia pyramidalis*, *Bl.*, and *Allophras*, with which are often mixed *Alpinia nativa* and *Renealmia Galanga*. The seeds of many parts of the properties of the root. *Cardamomum* are the seeds of several plants of this Order. On the eastern frontiers of Bengal the fruit of *Anomum aromaticum* is used. Malabar *Cardamoms* are produced by *Elettaria Cardamomum*; Ceylon *Cardamoms*, an inferior sort, by *Elettaria major*. Grass of Paradise, a sort of hot acrid seed, used to give a pungent flavour to spirituous liquors, belong principally to *Anomum Grama Paralis*, but *Anomum angustifolium*, *macrosperrum*, *maximum*, and *Clusi* are, according to Dr Pereira, also the persons of an inferior description of this seed. Others are known for their dyeing properties, such as *Turneric*. This substance, obtained from *Curcuma longa*, is cooling and stomachic; it is also considered by the native practitioners of India an excellent application in powder for cleaning foul ulcers. The fruit of *Globba uviformis* is said to be eatable. Generally, in consequence of the presence of the aromatic oil that is so prevalent in the Order, the roots or rhizomes, although abounding in starch, are not fit for the preparation of arrow-root; but an excellent kind is prepared in Travancore, in the East Indies, from *Curcuma angustifolia*.

A species of *Curcuma* is supposed by Von Martius to furnish the astringent Median drug called *Cascara de Pingue*, which abounds in tannin. What is called *Cascara de Lingue* is the bark of some tree. (*Chamae. Gaz.* 1844. 263.) The American *Renealmia* are stated by Peppig to have aromatic leaves which, when bruised, are employed in pains of the limbs. The roots of *Costi* are very bitter, and have had a great reputation as tonics, but they are out of use. The roots of *Alpinia aromatica* and *Paeo sericea* are sweetly aromatic, and are employed in Brazil as emmenagogues and stomachics. — *M.* — Ad the Brazilian *Costi* have a sub-acid mucilaginous juice, which is used in nephritic disorders and gonorrhoea. — *Id.* According to Roxburgh the pendulous tubers of *Curcuma rubescens* and several other species yield a very beautiful pure starch, like Arrow-root, which the natives of the countries where the plants grow prepare and eat. In Travancore this flour or starch forms a large part of the diet of the inhabitants. Such Arrow-root, obtained from *C. angustifolia*, is commonly sold in the markets of Benares. See *Flora Medica* for further information concerning these plants.

GENERA. — (*Much in need of re-examination.*)

<i>Globba</i> , Linn.	<i>Kamferia</i> , Linn.	<i>Domedodes</i> , Blume.	<i>Hellaria</i> , Winkl.
<i>Catalpaum</i> , Juss.	<i>Sencerus</i> , Rumph.	<i>Dracodes</i> , Blyth.	<i>Alpinia</i> , Gussone.
<i>Colebroekia</i> , Don.	<i>Trilophus</i> , Lesteb.	<i>Hedychaum</i> , Kuntz.	<i>Menthaea</i> , Gussone.
<i>Ceratanthera</i> , Horn.	<i>Roscoea</i> , Smith.	<i>Goniatanthum</i> , Rumph.	<i>Hornsea</i> , Reem.
<i>Horn</i> , Koenig.	<i>Anomum</i> , Linn.	<i>Gamochilus</i> , Lesteb.	<i>Lacucha</i> , K. & A.
<i>Sphaeracarpus</i> , Gawl.	<i>Ceratanthera</i> , Rumph.	<i>Renealmia</i> , Linn.	<i>Menthaea</i> , Juss.
<i>Menthaea</i> , Gussone.	<i>Menthaea</i> , Salisb.	<i>Alpinia</i> , Planch.	<i>Catalpaum</i> , Blume.
<i>Ceratanthera</i> , Hornem.	<i>Alpinia</i> , Salisb.	<i>Gallipia</i> , Salisb.	<i>Costus</i> , Linn.
<i>Mantisia</i> , Curt.	<i>Hornstedtia</i> , Retz.	<i>Peperidium</i> , Lesteb.	<i>Peperidium</i> , Gussone.
<i>Zingiber</i> , Gussone.	<i>Maisteria</i> , Gussone.	<i>Alpinia</i> , Linn.	<i>Peperidium</i> , Gussone.
<i>Jagera</i> , Gussone.	<i>Wueflandia</i> , Gussone.	<i>Zerandul</i> , Jacq.	<i>Peperidium</i> , Kuntz.
<i>Dietrichia</i> , Gussone.	<i>Gussonea</i> , Gussone.	<i>Costus</i> , Pers.	<i>Hellaria</i> , Kuntz.
<i>Cuscutaria</i> , Colla.	<i>Fajudaria</i> , Gussone.	<i>Elettaria</i> , Salisb.	<i>Goniatanthum</i> , Rumph.
<i>Lauriparia</i> , Rumph.	<i>Elettaria</i> , Gussone.	<i>Alpinia</i> , Linn.	<i>Jacquinia</i> , Juss.
<i>Curcuma</i> , Linn.	<i>Elettaria</i> , Blume.	<i>Buckia</i> , Gussone.	<i>Menthaea</i> , Juss.
<i>Zerandul</i> , Rumph.	<i>Mulonia</i> , Sm.	<i>Urticaea</i> , Lesteb.	<i>Kuntzia</i> , Pers.
<i>Stisseria</i> , Gussone.	<i>Cuscutaria</i> , Salisb.	<i>Leptosiphia</i> , Pers.	<i>Nyctophanta</i> , Gussone.
<i>Fendia</i> , Gussone.	<i>Gussonea</i> , Reemw.	<i>Gastrophilus</i> , Blume.	<i>Hellaria</i> , Gussone.

NUMBERS. GEN. 29. Sp. 247.

POSITION. — Musaceæ. — ZINGIBERACEÆ. — MARTIACEÆ.  
*Orchidaceæ.*

ADDITIONAL GENERA.

*Alpinia*, Gussone. *Alpinia*, Gussone.  
*Stisseria*, Gussone. *Alpinia*, Gussone.



## ORDER L. MARANTACEÆ.—MARANTS.

Cannæ, *Juss. Gen.* 62. (1789) *in part.*—Cannæ, *R. Brown, Prodr.* 1. 307. (1810).—Cannæ or Marantææ, *Brown in Flinders*, (1814).—Cannaceæ, *Agardh Aph.* 181. 1823; *Link Handb.* 1. 223. (1829), a sect. of Scitamineæ; *Endl. Gen.* l. ix; *Lestiboudois in Ann. Sc.* 2 ser. 17. 205.; *Meisner, p.* 389.

DIAGNOSIS.—*Aromal Endogens, with one stamen, half an anther, and no vitellus.*

Herbaceous tropical plants, destitute of aroma. Rhizome often tuberous, and abounding in starch. Stem often branching. Leaves, inflorescence, and flowers, as in Gingerworts. Calyx superior, of 3 sepals, short. Corolla tubular, irregular, with the segments in 2 whorls the outer 3-parted, nearly equal: the inner very irregular; one of the lateral segments usually coloured, and formed differently from the rest; sometimes by abortion fewer than 3. Stamens 3, petaloid, distinct, of which one of the laterals and the intermediate one are either barren or abortive, and the other lateral one fertile. Filament petaloid, either entire or 2-lobed, one of the lobes bearing the anther on its edge. Anther 1-celled, opening longitudinally. Pollen round (papillose in *Canna coccinea*, smooth in *Calathea zebрина*.) Ovary 1-3-celled; ovules solitary, erect, and campylotropal, or numerous, anatropal, and attached to the axis of each cell; style petaloid or swollen; stigma either the mere denuded apex of the style, or hollow, cucullate, and incurved. Fruit capsular, as in Gingerworts. Seeds round, without aril; albumen hard, somewhat floury; embryo straight, naked, its radicle, lying against the hilum.

Under Gingerworts, the relations of that Order and the present to other monocotyledonous groups has been noticed. In this place the distinction between the two Orders has to be explained. In true Gingers, as Brown has observed (*Prodr.* 305.), the stamen is always placed opposite the labellum or anterior division of the inner series of the corolla, and proceeds from the base of the posterior outer division; while the sterile stamens, when they exist, are stationed right and left of the labellum. But in Marants the fertile stamen is on one side of the labellum, occupying the place of one of the lateral sterile stamens of Gingerworts. This peculiarity of arrangement indicates a higher degree of irregularity in Marants than in Gingers, which also extends to the other parts of the flower. The suppression of organs takes place in the latter in a symmetrical manner; the two posterior divisions of the inner series of the perianth, which are occasionally absent, corresponding with the abortion of the two anterior stamens. In Marants, on the contrary, the suppression of organs takes place with so much irregularity, that the relation which the various parts bear to each other is not always apparent: instead of the central stamen being perfect while the two lateral ones are abortive, as in Gingerworts and most Orchids, or of the central stamen being abortive and the two lateral ones perfect, as in some Orchids, it is the central and one lateral one that are suppressed in Marants. In

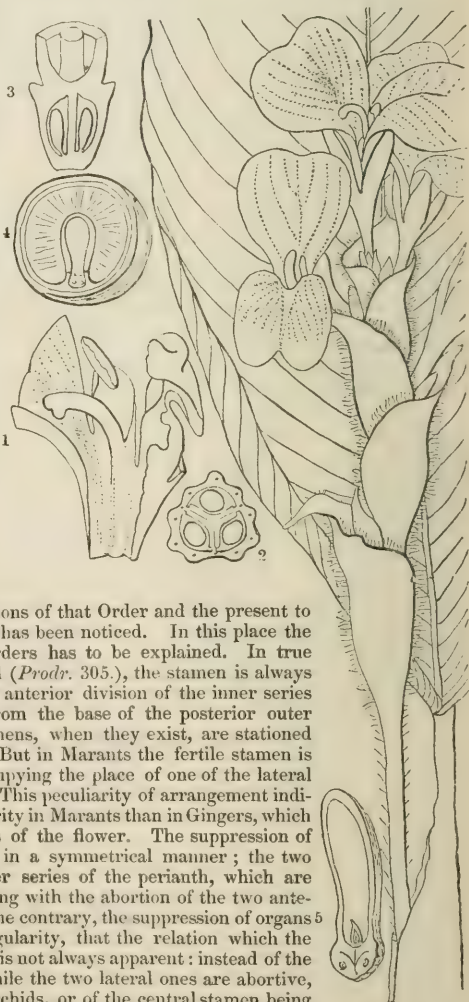


Fig. CXV.

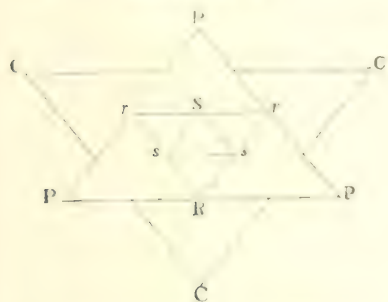
Fig. CXV.—*Calathea villosa*; 1. a flower cut open; 2. a transverse section of the ovary; 3. a perpendicular section of it; 4. a section of the seed of *Canna*; 5. a section of its embryo.



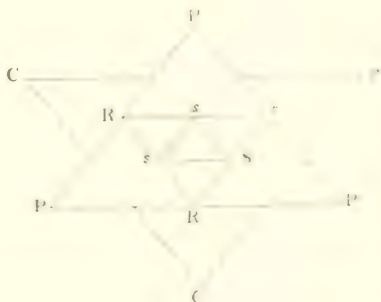
the perianth of *Canna* only the most external part within the calyx but possibly be called corolla; the remainder of the segments being allotted to produce barren petaloid stamens analogous to what is called the inner limb of the corolla in *Gingeraceæ*, and the characters upon which botanists found their specific distinctions depend upon the degree to which this development of petaloid abortive stamens extends. When, for instance, they describe some as having an inner limb of 2 or of 3, or of 4 or of 5 segments, they should rather say 2, 3, 4, or 5 stamens are partially developed.

Perhaps it will be possible to put the relative structure of *Gingeraceæ* and *Marantæ* in a clearer light by the following diagrams, in which the triangles C, C, C represent the calyx, the angles corresponding with the position of the sepals; the triangle P, P, P the corolla; R, r, r an outer series of petaloid stamens, of which r, r are rudimentary only; and S, s, s the inner series of stamens, of which S is the fertile and fully developed one.

GINGERWORTS.



MARANTS.



The greater part are found in tropical America and Africa; several are natives of India; none are known in a wild state beyond the tropics.

While Gingerworts are valued for their aromatic heating principle, the Marants are esteemed on account of the fecula, which abounds in the rhizome and root of both tribes, the Gingerworts being destitute of that principle; on this account it is collected as a nutritious article of food, both from *Maranta arundinacea*, *Allouvia*, and *nobilis*, in the West Indies, and also from *Maranta ramosissima* in the East. The fleshy corms of some *Cannas* are reported to be eaten in Peru, and a sort of Arrow-root called *tous les mois* is extracted in the West Indies from some species supposed to be *C. Achiras*. The seeds of others, called Indian shot, have been used as a substitute for Coffee, and yield a purple dye. A tough fibre is obtained from *Phrynium dichotomum*; and the leaves of the South American *Calathea*s are worked into baskets, whence their name. The juice of *Maranta arundinacea* is said to be efficacious in poisoned wounds; it is acrid when fresh, reddening the skin, and exciting saliva when chewed. The tubers of *Maranta Allouvia*, cooked with pepper and salt, are eaten in the West Indies. *Martius* says that the corms of *Canna aurantiaca*, *glauca*, and others, are diuretic and diaphoretic, and are not unlike Orris-root in action.

GENERA.

*Canna*, *Linnaeus*.  
*Peruvia*, *DC.*  
*Maranta*, *Planch.*  
*Phrynium*, *Walt.*

*Phrynium*, *London*.  
*Calathea*, *G. F. B. Meyer*.  
*Arundo*, *Nees*.  
*Myosma*, *London*.

*Canna*, *Linnaeus*.  
*Peruvia*, *DC.*

NUMBERS. GEN. 6. Sp. 100.

POSITION.—Zingiberaceæ. Marantaceæ.

ADDITIONAL GENERA.

*Eurystylis*, *Benth.* *Canna*, *Linnaeus*. *Peruvia*, *DC.*



ALLIANCE XIII. *ORCHIDALES*.—THE ORCHIDAL ALLIANCE.

DIAGNOSIS.—*Epigynous Endogens, with 1 to 3 stamens, and seeds without albumen.*

At this point there is an abrupt break in the series of direct affinity. No gradual change can be traced from other natural Orders to that of the Orchidal Alliance, which is distinguished by the embryo not only having no albumen, but being a solid homogeneous body, equally destitute of any visible radicle or cotyledon. In the majority the structure is what Linnaeus called Gynandrous ; that is to say, the stamens, and style, and stigma, are blended together into one solid body, named a column ; in two, however, of the natural Orders of which it consists, the stamens are perfectly free. If we neglect the condition of the seeds, we then may find a variety of approaches to other Orders, as, for example, to the Irids, in which *Gladiolus* seems to be an imitation of the structure of an *Orchis* ; or to *Sisyrinchium*, to which *Thelymitra* or *Paxtonia* offer some analogy ; or to the Hypoxids, of which *Apostasias* and *Tropidia* have much the aspect ; or to Gingerworts, whose close heads of imbricated bracts are imitated in *Evelyna*. The *Burmanniads* are remarkable for their perfect symmetry, among hundreds of species whose prevailing character is want of symmetry.

NATURAL ORDERS OF ORCHIDALS.

- |   |                   |
|---|-------------------|
| <i>Flowers regular. Stamens free, perigynous . . . . .</i>        | 51. BURMANNIACEÆ. |
| <i>Flowers irregular, gynandrous. Placentæ parietal . . . . .</i> | 52. ORCHIDACEÆ.   |
| <i>Flowers regular, half-gynandrous. Placentæ axile . . . . .</i> | 53. APOSTASIACEÆ. |



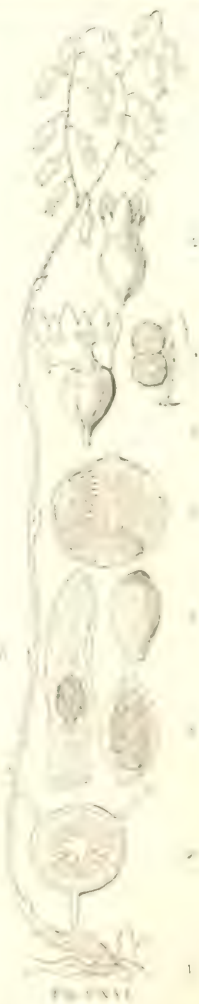
## Omerik, L.I., BURMAN, I.O.E., JOURNAL OF CLIMATE

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DIAGNOSIS.—*Orchidid Eulimna*, with regular flukes and five pericardial muscles.

Herbaceous plants, with tufted radical acute leaves, or none. Calyx tubular, 1 or 2-celled, with alternate minute sessile bract-forma leaflets; 2 flowers terminal, or a cyme with 2-3 branched racem, numerous and alternate, or solitary, pedicelled or sessile. Calyx and corolla concolorous, united in a simple perianth, the petals rarely all either wanting; calyx superior, tubular, elongated, sometimes ventricose, either simple, or furnished with three long and broad wings; border divided into 3 equal reflected segments opposite the wings when present, imbricate in aestivation; petals (when not deficient 3 in an inner series, alternate with the outer segments, generally narrower, small, and erect, but sometimes extremely long, subulate, and curled inside the tube in aestivation. Stamens fixed below mouth of tube, either 3 introrse, and opposite petals, or 6 extrorse, opposite petals and outer segments; filaments in the former case short, adnate to the tube, saccate, erect, or winglike appendages, in the latter case consisting of dilated broad pendent membranaceous processes, originating in the mouth of the tube, sometimes quite free, or else distant at their points of insertion, but united in the middle in a monadelphous annular pendent ring, bearing the anthers on their external face, looking towards the calycine tube. Anthers, 2-celled, the cells always separated at some distance from one another, each 2-lobed, bursting by a transverse gaping fissure between the lobes. Ovary inferior, either 1-celled, with 3 parietal placentæ, or 3-celled, with placentation in double lines along the axis in each cell, the cells being opposite the outer segments of the border: ovules innumerable. Capsule surmounted by the persistent calyx, 1 or 3-celled, bursting vertically, or horizontally, or follicle-like by a single lateral fissure, or in an irregular manner by a circumscissile line at the junction of the calyx with the pericarp. Seeds innumerable, very minute, scabiform, with a tight or loose testa of network texture; nucleus apparently solid and homogeneous, without any visible embryo. — *Miers.*

This is a most singular race, which has been well illustrated by Mr. Miers, who has been the first to point out its relationship to the Orchids. Thus he has shown to consist in the minute seeds, parietal placentæ, in many cases peculiar condition of the capsule, and the nucleus loose in the middle of a netlike testa; to this may be added the organisation of the seed, which to all appearances is exactly like that of Orchids, and which, probably, in both cases approach the state of embryo described under the head of *Truridaceæ* (p. 144 n.). In the construction of the ovary two very distinct conditions are pointed out by Mr. Miers; in the tribe *Burmamiæ* it has three cells, with axile placentation; in the tribes *Apterisæ* and *Thlaspiæ* it is 1-celled, with 3 parietal placentæ, a difference in development that he regards as being of secondary importance.



**Fig. CXVI** — 1. Distylectus sp. (holotype) ♂; 2. Distylectus sp. (paratype) ♂; 3. Distylectus sp. (paratype) ♀; 4. half an anther; 5. setae from the distal part of the abdomen; 6. setae from the anterior setacea; 7. transverse section of the ovary; 8. Distylectus sp. (holotype) ♂.



The single genus upon which the order was founded, was placed by Jussieu in Bromeliads. Brown stationed it as a doubtful genus at the end of Rushes, with the remark that it is extremely distinct, both in flower, fruit, and inflorescence, and not really allied to any other known plant, but more nearly related to *Xyris* and *Philydron*, than to either *Bromelia* or *Hypoxis*. Von Martius, who has beautifully illustrated the Brazilian species, refers them to *Hydrocharads*. Blume, who added two new genera, remarks, "that the order is known from Juncaceæ by its tubular perianth, which is petaloid, not glumaceous, and by the structure of the fruit; it is well distinguished from Irids by the station of the stamina, and the tranverse dehiscence of the anthers."—*Enum.* p. 27.

The genus *Thismia*, which offers many characters at variance with the usual structure of the order, was placed by Griffith near *Tacca*, noticing at the same time its approach to *Burmanna* in the structure of its seeds. Blume stations *Sarcosiphon* near *Thismia*, in *Cytinaceæ*. *Ophiomeris*, a Brazilian genus, closely allied to *Thismia*, was believed by Mr. Miers to belong to *Burmanniaceæ*, singularly differing from the usual structure of the family in the form of its petals, the extrorse position and the union of the stamens into a monadelphous ring, and in the circumscissile and opercular dehiscence of its fruit. It disagrees with every other genus of this otherwise always symmetrical order, in the very gibbous form of its tubular perianth: it agrees, however, with *Thismia*, in its mouth being almost closed by an annular corona, and by the tail-like form of its very elongated petals, enclosed and coiled in bud, thus offering much analogy to the structure seen in *Triuridaceæ*, which they also resemble in their seeds containing an "inembryonal nucleus." The existence of extrorse stamens would form a material distinction, were it not evident, that this circumstance is due simply to the deflexion of the filamentary processes, for when turned up into the usual erect position, they naturally become introrse. Although left here for the sake of illustrating completely Mr. Miers' views, I cannot but think that *Thismia* and *Ophiomeris* really belong to *Cytinaceæ*.

In reality the order must be considered to connect Orchids and Irids.

Natives of marshy, grassy, and shady places in the tropics of Asia, Africa, and America. *Burmanna* is found as far North as Virginia in North America.

*Apteria setacea* is slightly bitter, and very astringent; a similar flavour, something like that of green tea, is discernible in *Burmanna cærulea*.—*Nuttal*.

The following arrangement of the genera, and many of the previous considerations, have been communicated by Mr. Miers:—

#### GENERA.

1. BURMANNIÆÆ.	2. APTERIÆÆ.	3. THISMIEÆÆ.
<i>Burmanna</i> , Lin.	<i>Gymnosiphon</i> , Bl.	<i>Thismia</i> , Griff.
<i>Tripterella</i> , Mich.	<i>Dictyostegia</i> , Miers.	<i>Sarcosiphon</i> , Bl.
<i>Vogelia</i> , Gmel.	<i>Cymbocarpa</i> , Miers.	<i>Ophiomeris</i> , Miers.
<i>Maharaja</i> , Thouars.	<i>Apteria</i> , Nutt.	
<i>Anonurus</i> , Walt.	<i>Stemoptera</i> , Miers.	
<i>Gonyanthes</i> , Bl.	<i>Ptychomeria</i> , Spruce.	
<i>Tripteranthus</i> , Wall.		
<i>Tetraptera</i> , Miers.		
<i>Tripterella</i> , Mart.		

NUMBERS. GEN. 10. Sp. 38.

*Iridaceæ*.

POSITION. — *Apostasiaceæ*. — *BURMANNIACEÆ*. — *Orchidaceæ*.







next the axis ; occasionally surrounded by a calyculus (or true calyx). Petals (which are to be regarded as sterile stamens) usually 3 ; very rarely one only, placed between the sepals : the lateral usually similar to the dorsal sepal ; the third, called the lip (*labellum*), usually larger than the petals, and quite unlike them in form ; horned or furnished with various appendages, free or adherent to some other body, occasionally moveable as if spontaneously ; now and then contracted so as to form two separate parts, of which the lowest is called the hypochil, the highest the epichil, and the middle one the mesochil ; sometimes furnished with a single or double appendage, derived from the stigma. Column consisting of the stamens and style consolidated into a central body, so that the latter stands next the lip and the former next the dorsal sepal, sometimes petaloid, and occasionally extended far beyond the perianth (*corymbis*). Stamens 3, opposite the sepals, the central only being perfect, except in *Cypripedium*, when the central is abortive and the two lateral perfect ; anthers occasionally one-celled ; usually two-celled, with the cells separated by 2 or 4 partitions ; standing erect at the end of the column, or turned down flat upon it, or altogether dorsal ; pollen powdery, or collected into grains, or adhering in wedges tied together by an elastic material, or consolidated into masses of a waxy texture and fixed number, the masses either free or adhering by a caudicle to a gland belonging to the apex (or *rostellum*) of the stigma. Ovary adherent, 1-celled, composed of 6 carpels, of which 3, opposite the petals, have didymous polyspermous parietal placentæ without stigmas, and 3 opposite the sepals have as many stigmas but no placentæ ; style never distinct, except in *Cypripedium* and some *Neottieæ* ; stigmas usually confluent in a hollow (or prominent) mucous disk ; the dorsal stigma having on the upper edge one or two glands, which are separate in *Vandeæ* and *Neottieæ* ; often extended into a beak (*rostellum*), or hollowed out into pouches, or sometimes drawn out into 2 parallel or diverging arms ; the lateral stigmas usually obsolete, but sometimes united to the base of the lip in the form of an appendage or pair of plates. Capsule very rarely fleshy, indehiscent and pod-shaped, usually breaking up into 6 dry woody rigid valves with horizontal cells, of which 3 only bear seeds. Seeds innumerable, very minute, with a loose netted skin, very rarely with a hard crustaceous one, sometimes expanded into a circular wing ; embryo solid, fleshy, without albumen ; chalaza at the apex of the seed, and therefore the radicle next the hilum.

The general structure of Orchids, briefly embodied in the foregoing description, has been treated of at such length in the prefatory matter of the *Illustrations of Orchidaceous Plants*, that it is unnecessary to do more than refer the reader to that work. I must, however, take the opportunity of correcting one part of the theoretical view which was there taken of the structure of the column. While, in common with Dr. Brown, I regarded the stigma as really consisting of three parts, usually in a state of confluence, I also supposed the position of the stigmata to be opposite the petals ; being led to that conclusion by the constant position of the stigmatic arms of *Ophrydæ*. That opinion I afterwards retracted, in consequence of the position of the stigmas in *Cypripedium*, which *C. spectabile* shows most clearly to be opposite the sepals ; and therefore the stigmatic arms of *Ophrydæ* are to be understood as side lobes of that stigma which is opposite the dorsal sepal. This circumstance, however, only confirms the accuracy

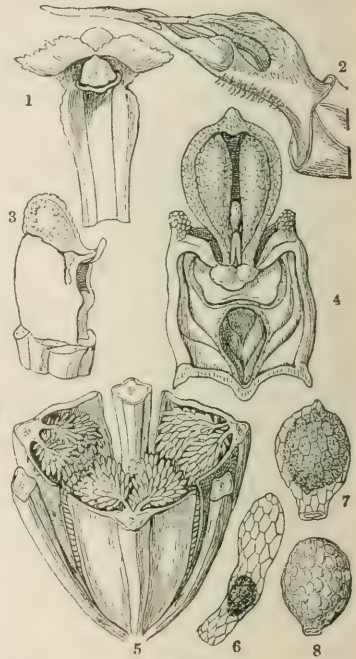


Fig. CXIX.

Fig. CXIX.—1. Column of *Arethusa* ; 2. of *Stenorrhynchus* ; 3. of *Brassica maculata* ; 4. of *Orchis mascula* ; 5. section of capsule of *Ophrys apifera* ; 6. seed of *Ophrys* ; 7. of *Pterygodium atratum* ; 8. of *Vanilla aromatica*.



of my view of the true nature of the stamens, which are certainly all opposite the lobes of the stigma in *Cypripedium*. While, however, the untenableness of the first opinion concerning the relation borne by the stigmas to the other parts of the flower is thus admitted, there remains a difficulty that opposes itself to the view I now take in common with Brown, and which must not be overlooked. It is that the pluriflorous pieces of the ovary are not opposite the stigmas, but alternate with them, while the monoflorous pieces of the ovary are in a line with the stigmata. This seems to show that the ovary is composed of 6 carpellary leaves, of which three bear stigmas without ovules, and three bear ovules without stigmas. However paradoxical this may appear, it is by no means incompatible with the due performance of the functions of fecundation. For the carpellary leaves do not adhere into a solid mass, either in the ovary or in the style. On the contrary they form a cavity open from the stigmatic apex down to the ovules, and the whole of that cavity is lined with a lax conducting tissue, which may nevertheless be exclusively furnished by 3 stigmas only, and may become so confluent with the placenta as to form a perfect channel of communication for the pollen tubes in their descent into the ovules.

The Order owes its chief peculiarities to the following circumstances: firstly, to the consolidation of stamens and pistil into one common mass, called the column; secondly, to the suppression of all the anthers, except one in the mass of the stigma, or two in *Cypripedææ*; thirdly, to the peculiar condition of its pollen, and the anther which contains it; and fourthly, to the very general development of one of the inner leaves of the perianth or petals in an excessive degree, or in an unusual shape. These peculiarities are in most cases so striking, and are all so strongly manifested in the same flower, that the inexperienced botanist may be unable to discern their real character. We find, however, that the true nature of each part is indicated by special cases of structure occurring in different parts of the Order. Thus in *Cypripedium* not only are two lateral stamens furnished with anthers, while the central stamen is antherless, but the stigma and style separate from the filaments nearly to the base, and the triple nature of the former is distinctly shown, together with the relation of its lobes to the other parts of the flower. The pollen, which has so anomalous an appearance in its waxy or seetile state, presents the usual appearance of that substance in *Goodyera*, and many *Neottieæ*. And the irregularity of the labellum disappears in such genera as *Thelymitra*, *Pantonia*, *Macdonaldia*, *Hexisea*, and some others, whose flowers are almost as regular as those of a *Sisyrinchium*. It is indeed to the latter genus, more nearly than to any other, that Orchids seem to approach in structure, unless to *Gingerworts*; so that they may be supposed to pass into Irises through *Thelymitra* and *Sisyrinchium* on the one hand, and into *Gingerworts* through *Phrynum* and some a genus as *Evelyna* on the other. With regard to *Apostasiads*, their relation to that Order does not appear to be greater than to either of the two now mentioned; and in the absence of all evidence as to the connecting links which join Orchids and *Apostasiads* it seems unnecessary to advert further to the subject. It may, however, be observed that *Apostasia* has apparently as much claim to be regarded as a diadelphous monadelphous *Hypoxid*, standing, perhaps, in the same relation to that Order as *Gilliesia* to *Lilyworts*, as it has to be regarded as a trilocular Orchid with its gynous organization lost.

It is not necessary to enter, in this place, into a history of the gradual alteration that has taken place in the views of botanists with regard to the structure of the sexual apparatus of these most curious plants, or to explain what degree of ignorance was shared by those who mistook masses of pollen for anthers, or a column of stamens for a style; and errors could only have occurred at a period when the laws of organization were unknown. They have been corrected, in a more or less perfect manner, by various writers: most completely by Brown in his *Prodomus*, published in 1819, and subsequently to the late most accurate and indefatigable Richard. But long before the publication of any rational explanation of the structure of Orchids, while botanists were in error here, upon the subject, it had been investigated by a man unrivalled in his day for the perfection of his microscopical analyses, the beauty of his drawings, and the admirable skill with which he followed Nature in her most secret workings; and he was still, which is a still rarer quality, the generous disinterestedness with which he communicated to his friends the result of his patient and silent labours. Sketches were issued by the late Francis Bauer, between 1794 and 1807, in which the most important part of what has been published since that period is distinctly shown; and it has long my great pleasure to be the humble means of giving some of these remarkable productions to the public: to the world, in the *Illustrations of the Genera and Species of the Antennarian Flora*.

If the column of an Orchidaceous plant is examined, it will be found to consist of a fleshy body stationed opposite the lip, bearing a solitary anther at its apex, and bearing in front a viscid cavity, upon the upper edge of which there is often a slight elevation, called the rostellum. This cavity is the stigma, and the rostellum is the point by which



the pollen masses are secured when any adhesion between them and the stigma takes place. Hence such a plant would appear to be monandrous ; it will be seen, however, in Gingerworts and Marants, the only other monandrous Orders of Endogens, that, while only one perfect stamen is developed, two others exist in a rudimentary state ; so that the ternary number prevalent in Monocotyledons is not departed from. So it is in Orchids : the column does not consist of a single filament cohering with a style, but of three filaments firmly grown together, the central of which is antheriferous, and the lateral sterile. This is proved by the frequent presence of callosities, or processes in the place of the sterile stamens ; by imperfectly-formed anthers occasionally appearing at the side of the perfect one ; and, if any further evidence were wanted, by monsters, in which a regular structure is exchanged for the ordinary irregularity. Such an instance in *Orchis latifolia* is described by Achille Richard, in the *Mémoires de la Soc. d'Hist. Nat. of Paris*, in which the flowers were perfectly triandrous, with no trace of irregularity in any part of the floral envelopes ; and other cases of a similar nature are by no means uncommon, and have been occasionally mentioned.

Orchids are remarkable for the unusual figure of their irregular flowers, which sometimes represent an insect, sometimes a helmet with the visor up, and are so various in form that there is scarcely a common reptile or insect to which some

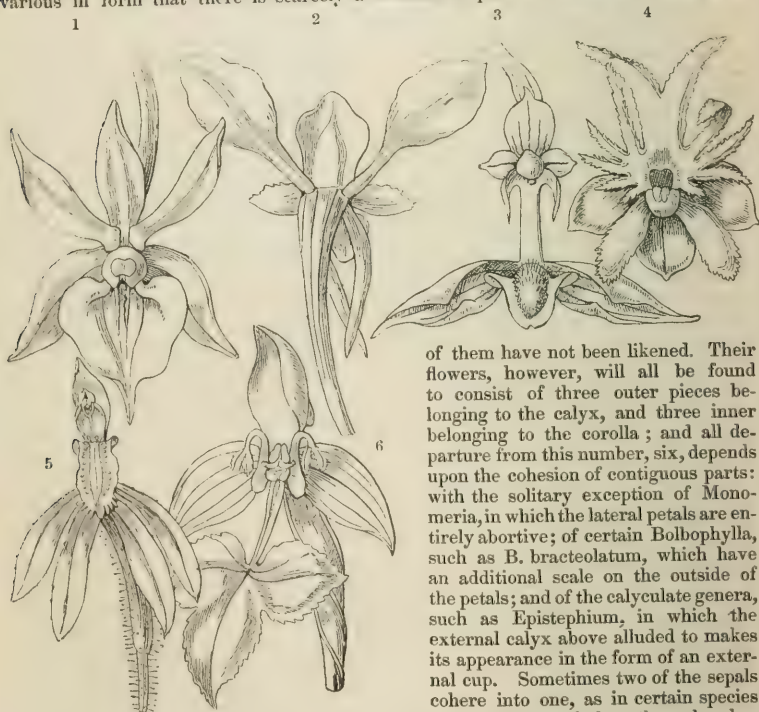


Fig. CXX.

sepals ; sometimes the lateral petals are connate with the column, as in *Gongora* and *Lepanthes*, and then the column appears furnished with two wings. In nearly the whole Order the odd petal, called the lip, arises from the base of the column, and is opposite it ; but in the Cape genus *Pterygodium*, the lip sometimes grows from the apex of the column, and sometimes is stalked and turned completely over between the fork of the inverted anther, and thus seems to belong to the back of the column. Nor is the anther less subject to modification, although constant to its place : sometimes it stands erect, the line of dehiscence of its lobes being turned towards the lip ; sometimes it is turned upside down, so that its back regards the lip ; often it is prone upon the apex of the column, where a niche is excavated for its reception. The pollen is not

Fig. CXX. 1. *Angraecum eburneum* ; 2. *Diuris* ; 3. *Drymoda picta* ; 4. *Oberonia Griffithiana* ; 5. *Caladenia* ; 6. *Disa spathulata*.



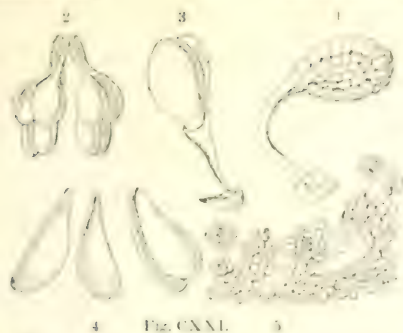


Fig. CXXI.

longer exposed; some are large, as in *Ophrys apifera*, and are borne on a separate gland, as in other genera, but referred to a modification of the central tissue, which is collected into a sort of central elastic strap; thus the granular column is at first slightly indurated, and the central elastic strap, bearing more or less, is found to be a true abscissal process of the stigma, which becomes enclosed in a peculiar pouch, especially destined for its protection; again, the pollen contains some larger masses, which are definite in number, and attached to a small modification of the elastic strap.

and finally a complete union of the pollen takes place, in solid waxy masses, without any distinct trace of this central elastic tissue. Such is a part of the singularities of Orchidaceous plants, and upon these the distinctions of their tribes and genera are naturally founded. Whoever studies them must bear in mind that their fructification is always reducible to 3 sepals, 3 petals, a column consisting of 3 stamens grown firmly to one another, and to a single style and stigma; and, with this view, he will have no difficulty in understanding the organization of even the most anomalous Cape species. In the last edition of this work an Order called *Vanillaceæ* was proposed, about which I shall only say that its introduction would have been much better omitted.

Professor Link has shown that beyond all doubt the nucleus of the seed in this Order is a naked embryo, with an excessively enlarged radicle. See his beautiful figures in the *Ausgewählte Anatomisch-botanische Abbildungen* (vol. 2, t. vii). Here we again have a structure analogous to that of *Nymphaea* and *Nelumbium*.

Among the most singular circumstances connected with this Order is the manner in which, upon the same spike, flowers of extremely different structure are produced. This was first noticed in Demerara by Sir R. Schomburgk, who published in the *Linn. Transactions* (17, 551) an



Fig. CXXII.

Fig. CXXI.—1. Pollen masses of *Ophrys apifera*, 2. of *Thymus pulegioides*, 3. of *Hymenophyllum*, 4. of *Malax paludosa*, 5. Pollen of *Stenophyllus apiculatus*.

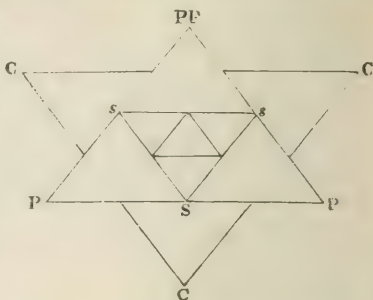
Fig. CXXII.—2. *Cynochelone ventricosa*, 3 and 4. *C. latifolia*, 5. *C. latifolia*.



account of the production of *Monachanthus viridis*, *Myanthus barbatus*, and a *Catasetum*, 3 supposed genera, upon the same spike; and he expressed his opinion that the *Catasetum* was the female of these, because he found it producing seeds abundantly, while *Monachanthus* was uniformly sterile. Afterwards a similar specimen made its appearance in the garden of his Grace the Duke of Devonshire at Chatsworth, and has been figured in the *Botanical Register*, fol. 1951. And still more lately two species of *Cycnoches*, *ventricosum* and *Egertonianum* have appeared in company, as represented in the accompanying figure (CXXII.)

Such cases shake to the foundation all our ideas of the stability of genera and species, and prepare the mind for more startling discoveries than could have been otherwise anticipated.

If the accompanying diagram be compared with those employed to illustrate the distinctions of Marants and Gingerworts, p. 169, the relation borne to those Orders by Orchids will be distinctly seen. In the diagram the parts are arranged as they are in nature before the ovary twists; that is, with the lip next the axis, or uppermost, and the stamen undermost. Let C, C, C represent the outer series of floral envelopes or calyx, and PP, P, P the inner, or corolla, of which PP is the labellum: then the position of the single fertile stamen will be at S, and the sterile ones at s, s; that is to say, in the situation of the supernumerary petaloid stamens of Gingerworts and Marants, while the second series of stamens, to which the fertile stamen of these Orders belongs, is not developed in Orchids.



In the last edition it was suggested that although this is the apparent structure of the Order, it is not improbable that the parts called sepals are the true petals, because *Epistephium* and others have a calyculus exterior to the apparent calyx. In that point of view the apparent petals would be sterile stamens, as among the Marants; it has, however, been shown by Crüger that the order of development of the floral organs of *Epistephium* is unfavourable to the supposition, and that the calyculus of that genus is in reality a cup-shaped expansion of the ovary. I quote his words from *Henfrey's Scientific Memoirs*, I. 170:—

"The development of the segments of the perianth is in agreement with the mode in which they subsequently overlie one another. At each side of the little nodule which is the first representative of the flower of this plant, we observe a little point, the first trace of the sepals, and a little later the middle sepal; at the same time with the latter, the two lateral inner segments of the perianth. Then the labellum appears, and almost simultaneously with that the anther. In this flower also the anther is at first erect, although it subsequently lies upon the summit of the column. Up to this time no trace of a calyculus is to be seen; it first presents itself clearly when the flower rises above the axil of the bract, and the boundary between the ovary and the segments of the perianth becomes visible. The calyculus is persistent upon the fruit, while the other parts separate from it at a very early period. I believe I am justified in concluding from the foregoing, that the calyculus, when it presents itself in the Orchidæ, does not represent an external circle of organs, because (1) its segments do not alternate with those of that standing above it; (2) they originate later than those; and (3) because they persist upon the capsule, while the other parts become detached. I should lay much stress upon the last reason, yet I think that this calyculus must be regarded as analogous to that which may be observed on the fruits of certain Compositæ, Dipsacæ, &c."

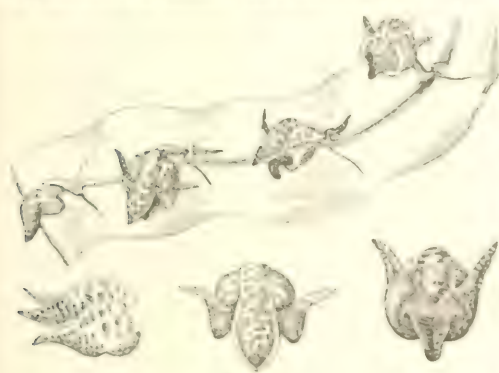
In classifying this Order the most important characters appear to reside in the pollen, which in many is consolidated into firm waxy masses of a definite number in each species, and in others is either in its usual loose powdery condition, or is collected in granules or small wedges, the number of which is far too great to be counted. Of those with waxy pollen masses some (*Malaxææ*) are destitute of any visible processes by which the masses are brought into contact with the stigma; others (*Epidendrææ*) have strap-shaped cau-



diels, which are often bent down upon the common filament, or serve to hold them together, without, however, forming any compound union with the stigma (as in the remainder (Vanillae) have a cuticle, which adheres firmly to a gland placed on the upper margin of the stigma, and separating freely from that organ. The primary cells, peltate, granular, or are like pollen, cannot be classified as constituting by themselves of that part, but are readily distended into a tubular tube by pressure from the outside. In some (Ophrys) the anther is erect, and hinged to the column, but sometimes arched, and stands above the stigma, the pollen masses having their points directed to the base, or the lobes of the anther; in others (Anacamptis) the anther is hinged to the column, upon the end of which it is placed transversely, and a bit (and in others (Xyris) it is also hinged to the column, but is stationed on its back near to the column, parallel with the stigmatic surface. If to this be added that Cypripedium have two apophyses, while all the others have one only, we find the Order divided into seven tribes, of which the following is a tabular view.

I. Anther one only.		II. Pollen granules united in masses.	
A. Pollen masses united.		1. Anther terminal, erect.	IV. Cypripedium
a. Anther erect, separate stigmatic disk.	3. Allium	2. Anther terminal, arched.	V. Anacamptis
b. A distinct column, but no separate stigmatic disk.	11. Xyris	3. Anther erect, separate.	VI. Cypripedium
c. A distinct column, united to a stigmatic disk.	10. Vanilla		
		II. Anther two.	III. Vanilla

Among many other remarkable peculiarities the irritability of the labellum must not be passed over in silence. This is extremely striking in various species of *Pteris*, and in the genus *Habenaria*, especially *barbigerum* and *Cucullaria*. But some of the most lively species are still more singular. In *Cathartes* (Drummond), Mr. Drummond described the structure to the following effect. The column has cone-shaped lobes, resembling a flower (as in the *Habenaria*) and a lid that exactly fits it, and is placed on a pivot which reaches the middle of the column; when the flower opens, the lid (the pistil) moves round within the column, and falls back, so that, the flower being inverted, it stands before the column. The column



1. CXXIII.

a small insect touches its point, the lid turns round, and falls back, so that the insect enters the column, passing the anther on its way, and thus makes provision for any insect which the box will hold. When it catches an insect it remains shut while its prey continues to move about; but if no capture is made the lid soon recovers its position. Another plant, *Dracopis* (Drummond), has a single flower placed at the end of a slender smooth erect scape, from twelve to eighteen inches high, and its labellum, which is hammer-headed, and placed on a long arm with a moveable elbow-joint in the middle, is stated by Mr. Drummond to resemble an insect suspended in the air, and moving with every breeze. Another plant of this description is *Sphecodia* (Drummond), whose many flowers when spread open may be compared to long-legged spiders, the lip with a long solid barrow looking like their body, while an appendage at its apex, which is apparently moveable, is not unlike the head of such a creature.

Orchids are found in almost all parts of the world, except upon the verge of the frozen

the genus *Habenaria*, especially *barbigerum* and *Cucullaria*. But some of the most lively species are still more singular. In *Cathartes* (Drummond), Mr. Drummond described the structure to the following effect. The column has cone-shaped lobes, resembling a flower (as in the *Habenaria*) and a lid that exactly fits it, and is placed on a pivot which reaches the middle of the column; when the flower opens, the lid (the pistil) moves round within the column, and falls back, so that, the flower being inverted, it stands before the column. The column



2. CXXIII.

FIG. CXXIII. — *Menachnum* (Raf.) L. a portion of a young specimen of *Menachnum* (Raf.) L. showing the lid and the column.

FIG. CXXIII. — *Sphecodia* (Drummond) flower.



zone, and in climates remarkable for dryness. In Europe, Asia, and North America, they are seen growing everywhere, in groves, in marshes, and in meadows; in the drier parts of Africa they are either rare or unknown; at the Cape of Good Hope they abound in similar situations as in Europe; but in the hot damp parts of the West and East Indies, in Madagascar, and the neighbouring islands, in the damp and humid forests of Brazil, in the warm mild parts of Central America, and Western Mexico, in the damp tropical parts of India, and on the lower mountains of Nipal, the Orchidaceous plants flourish in the greatest variety and profusion, no longer seeking their nutriment from the soil, but clinging to the trunks and limbs of trees, to stones and bare rocks, where they vegetate among ferns and other shade-loving plants, in countless thousands. Of the epiphytal class, one only is found so far north as South Carolina, growing upon the branches of the Magnolia, if we except the species from Japan, a country which has a climate peculiar to itself, among regions in the same parallel of latitude. The most southern stations are those of *Earina mucronata* in New Zealand, in lat. 35° S., and of *Gunnia australis* in Emu Bay, Van Diemen's Land, lat. 41° S. Ample details respecting their distribution in Australia are given by A. Cunningham in the *Botanical Register* for 1843 t. 37.

It often happens that those productions of nature which charm the eye with their beauty, and delight the senses with their perfume, have the least relation to the wants of mankind, while the most powerful virtues or most deadly poisons are hidden beneath a mean and insignificant exterior: thus Orchids, beyond their beauty, can scarcely be said to be of known utility, with a few exceptions. The nutritive substance called Salep has been prepared from the subterranean succulent roots of *Orchis mascula* and many others of the Ophreous division; and in India from the tubers of a species of *Eulophia*; it consists almost entirely of a chemical principle called Bassorin. The root of *Bletia verecunda* is said to be stomachic. Some of the South American species, such as the *Catasetums*, *Cyrtopodiums*, &c., contain a viscid juice, which being inspissated by boiling, becomes a kind of vegetable glue used for economical purposes in Brazil. The viscosity of the tuber of *Aplectrum hyemale* is such that it is called Putty-root in the United States, and is used for cementing broken earthenware.

Other medical qualities have been assigned to other species, but they seem to be of no importance; thus, *Arethusa bulbosa* is employed in the United States in toothache and bringing tumours to a head, *Spiranthes diuretica* as a diuretic in Chile, where also *Chloræa disoides* is fancied to promote the flow of milk. *Cypripedium pubescens* is used in North America as a substitute for Valerian, *C. guttatum* in Siberia against epilepsy. Vanilla is one of the most delightful aromatics known; it is used in the manufacture of chocolate, of liqueurs, and of various articles of confectionery. The substance called by this name in the shops is the dried fruit of



Fig. CXXIV.

*Vanilla planifolia*, and other species; it contains a great quantity of essential oil, and a good deal of benzoic acid. Dr. Bird says that the effluvia of *Vanilla* intoxicates the labourer who gathers it.—*Peter Pilgrim*, l. 234. See *Linnaea*, 4. 573, for some account of the cultivation of the plant in Mexico. *Vanilla claviculata* is bitter as well as fragrant, and its leaves are regarded in the West Indies, where it is called *Liane à blessures*, as a vulnerary, and antisyphilitic. In New Holland many species are eaten by the natives, who find their starchy roots a good article of diet. Mr. Backhouse describes the *Gastrodia sesamoides* as having a root like a series of kidney potatoes, terminating in a branched, thick mass of coral-like fibres. It is eaten by the aborigines of Tasmania, and is sometimes called native potato; but its tubers are watery and insipid.

P. Browne states that the corm of *Bletia verecunda* is "bitterish and attended by a clamminess that leaves a light prickly warmth behind it; but this wears off soon, leaving the palate free from every sensation but that of the bitter. When dried it may be used with great propriety as a stomachic." According to Sir R. Schomburgk the expressed juice of *Epidendrum bifidum* is a purgative, taken in doses of a table spoonful at a time; it is also reckoned in Tortola an anthelmintic, and diuretic, &c.—*Linnaea*, ix. 512.







*Miltonia*, *Lindl.*  
*Macrochilus*, *Knowles*.

PACHYPHYLLIDÆ.  
*Nasonia*, *Lindl.*  
*Centropetalum*, *Lindl.*  
*Pachyphyllum*, *H. B. K.*

MAXILLARIDÆ. *Lindl.* in  
*Bot. Reg.* 1843, misc. p.  
12.

*Stanhopea*, *Frost*.  
*Ceratochilus*, *Lodd*.  
*Houlletia*, *A. Brongn.*  
*Peristria*, *Hooker*.

*Eckardia*, *Rchb.*  
*Acineta*, *Lindl.*  
*Lacena*, *Lindl.*  
\* *Cuitlauzina*, *Llav.*  
*Govenia*, *Lindl.*

*Eucnemis*, *Lindl.*  
*Angidium*, *Lindl.*  
*Ratemannia*, *Lindl.*

*Gongora*, *Fl. Peruv.*  
*Acropera*, *Lindl.*  
*Coryanthes*, *Hook.*

*Chaenanthus*, *Lindl.*  
*Malachadenia*, *Lindl.*  
*Celia*, *Lindl.*

*Ornithidium*, *Salisb.*  
*Trigonidium*, *Lindl.*  
\* *Psittacozlossum*, *Llav.*

*Stenia*, *Lindl.*  
*Promenaea*, *Lindl.*  
*Grobysa*, *Lindl.*

*Warrea*, *Lindl.*  
*Huntleya*, *Lindl.*  
*Zycopetalum*, *Hooker*.

*Bifrenaria*, *Lindl.*  
*Stenocoryne*, *Lindl.*  
*Maxillaria*, *Fl. Per.*

\* *Nothium*, *Lindl.*  
\* *Xylobium*, *Lindl.*  
\* *Dicryphia*, *Lindl.*  
*Heterotaxis*, *Lindl.*

*Lycaste*, *Lindl.*  
*Anguloa*, *Fl. Per.*  
*Camariidum*, *Lindl.*

\* *Siagonanthus*, *Pöpp et*  
*Endl.*

*Seuticaria*, *Lindl.*  
*Scaphyglottis*, *Pöpp et E.*  
*Cladobium*, *Lindl.*

*Colax*, *Lindl.*  
*Paphinia*, *Lindl.*  
*Polystachya*, *Hooker*.

\* *Orchidofunkia*, *A. Rich.*  
*Clynhymenia*, *A. Rich.*  
\* *Galeottia*, *A. Rich.*

CATASETIDÆ. *Lindl.* in  
*Bot. Reg.* 1842, p. 22

*Catasetum*, *Rich.*  
*Monachanthus*, *Lindl.*  
\* *Myontheus*, *Lindl.*

*Mormodes*, *Lindl.*  
*Cyclosia*, *Klotzsch.*  
*Clovesia*, *Lindl.*

*Cynoches*, *Lindl.*  
*Cyrtopodium*, *R. Br.*  
*Tylochilus*, *Nees*.

NOTYLIDÆ.  
*Notylia*, *Lindl.*  
*Cirrhaea*, *Lindl.*

*Zygostates*, *Lindl.*  
\* *Imtylostyles*, *Scheidw.*  
*Ornithocepalus*, *Hook.*

\* *Trophianthus*, *Scheidw.*  
*Cryptarrhena*, *R. Br.*  
*Macradenia*, *R. Br.*

*Sutrina*, *Lindl.*  
*Telipogon*, *H. B. K.*  
*Trichoceros*, *H. B. K.*

*Trizeuxis*, *Lindl.*

*Quekettia*, *Lindl.*

IONOPSIDÆ.  
*Rodriguezia*, *R. et Pav.*  
*Gomeza*, *R. Br.*

\* *Scelochilus*, *Klotzsch.*  
*Burlingtonia*, *Lindl.*  
*Ionopsis*, *H. B. K.*

*Ianthu*, *Hook.*  
*Cybeton*, *Spreng.*  
\* *Diadenium*, *Pöpp et En.*

*Comporetia*, *Pöpp et En.*  
*Trichocentrum*, *Pöpp et E.*  
*Acidium*, *Lindl.*

CALANTHIDÆ.  
*Calanthe*, *R. Br.*  
*Centrosia*, *A. Rich.*

*Atismorchis*, *Thouars.*  
*Amblyglottis*, *Blume.*  
*Styloglossum*, *Kuhl et*

*Hass.*  
\* *Limatodes*, *Bl.*  
\* *Ghiesbrectia*, *A. Rich.*

\* *Tipularia*, *Nutt.*  
*Anthericlis*, *Raf.*  
*Geodorum*, *Jacks.*

*Otandra*, *Salisb.*  
*Cistella*, *Bl.*

#### IV.—OPIREÆ.

SERAPIADÆ.

*Orchis*, *L.*  
\* *Herorchis*, *Lindl.*  
\* *Androrchis*, *Endl.*

*Apocamptis*, *Rich.*  
*Nigritella*, *Rich.*  
*Aceras*, *R. Br.*

*Loroglossum*, *Rich.*  
*Himantoglossum*, *Spr.*  
*Serapis*, *L.*

*Helleborine*, *Pers.*  
*Ophrys*, *Swartz.*  
*Hemipilia*, *Lindl.*

*Glossaspis*, *Spreng.*  
*Glossula*, *Lindl.*  
*Perularia*, *Lindl.*

*Bartholina*, *R. Br.*  
*Lathristia*, *Swz.*

SATYRIADÆ.  
*Pachites*, *Lindl.*  
*Satyrion*, *Swz.*

*Diplectrum*, *Rich.*  
*Satyridium*, *Lindl.*  
*Aviceps*, *Lindl.*

GYMNADENIDÆ.  
*Aopla*, *Lindl.*  
*Hermionium*, *R. Br.*

*Arachnites*, *Hoffm.*  
\* *Chamorchis*, *Rich.*  
*Chamaerepes*, *Spr.*

*Gymnadenia*, *R. Br.*  
*Sieberia*, *Spr.*  
*Platanthera*, *Rich.*

*Mecosa*, *Bl.*  
*Peristylus*, *Blume.*  
*Benthamia*, *A. Rich.*

*Habenaria*, *W.*  
*Dissorhynchium*,  
*Schauer.*

\* *Centrocylus*, *Schauer.*  
*Ate*, *Lindl.*  
*Bonatea*, *W.*

*Bilabrella*, *Lindl.*  
*Stenoglottis*, *Lindl.*  
*Diplomeris*, *Don.*

*Diplochilus*, *Lindl.*  
*Paranymphus*, *Spreng.*  
*Bicornella*, *Lindl.*

*Cynorchis*, *Thouars.*  
\* *Amphorchis*, *Thouars.*  
*Celoglossum*, *Lindl.*

*Ommatodium*, *Lindl.*

#### HOLOTRICHIDÆ.

*Holothrix*, *Rich.*  
*Saccidium*, *Lindl.*  
*Monotris*, *Lindl.*

*Scopularia*, *Lindl.*  
*Tryphina*, *Lindl.*  
*Bucculina*, *Lindl.*

#### DISIDÆ.

*Disa*, *Berg.*  
\* *Repandra*, *Lindl.*  
\* *Phlebidia*, *Lindl.*

\* *Vaginaria*, *Lindl.*  
\* *Pardoglossa*, *Lindl.*  
\* *Coryphaea*, *Lindl.*

\* *Stenocarpa*, *Lindl.*  
\* *Oregura*, *Lindl.*  
\* *Trichochila*, *Lindl.*

*Disella*, *Lindl.*  
*Monadenia*, *Lindl.*  
*Schizidium*, *Lindl.*

*Penthea*, *Lindl.*  
*Forticaria*, *Lindl.*  
*Herschelia*, *Lindl.*

*Brachycorythis*, *Lindl.*  
*Brownleea*, *Harv.*

#### CORYCIDÆ.

*Pterygodium*, *Swz.*  
*Corycium*, *Swz.*  
*Dispersis*, *Swz.*

*Dipera*, *Spreng.*  
*Dryopeia*, *Thouars.*  
*Ceratandra*, *Lindl.*

\* *Hippopodium*, *Harv.*  
\* *Evota*, *Lindl.*  
*Calota*, *Harv.*

*Arnottia*, *A. Rich.*

#### V—ARETHUSEÆ.

LIMODORIDÆ.  
*Chloraea*, *Lindl.*  
*Epipactis*, *Feuill.*

*Asarca*, *Lindl.*  
*Gavilea*, *Pöpp.*  
*Asarca*, *Pöpp.*

*Bipinnula*, *Commers.*  
*Limodorum*, *Tournef.*  
*Cephalanthera*, *L. C. Rich.*

*Macdonaldia*, *R. Gunn.*  
*Eriochilus*, *R. Br.*  
*Diplodinium*, *Swartz.*

*Caladenia*, *R. Br.*  
*Calonema*, *Lindl.*  
*Leptoceras*, *R. Br.*

*Glossodia*, *R. Br.*  
*Elythranthe*, *Endl.*  
*Lyperanthus*, *R. Br.*

*Microtis*, *R. Br.*

ACIANTHIDÆ.  
*Acianthus*, *R. Br.*  
*Chiloglottis*, *R. Br.*

*Cyrtostylis*, *R. Br.*  
*Corysanthes*, *R. Br.*  
*Calcearia*, *Bl.*

*Coryphus*, *Salisb.*  
*Stenocorys*, *Endl.*  
*Pterostylis*, *R. Br.*

CALEYIDÆ.  
*Caleyia*, *R. Br.*  
*Calceana*, *R. Br.*

*Drakaea*, *Lindl.*  
*Spiculaea*, *Lindl.*

POGONIDÆ.  
*Pogonia*, *Juss.*  
*Triphora*, *Nutt.*

*Nervilia*, *Commers.*  
*Odonectis*, *Rafin.*  
*Isotria*, *Rafin.*

\* *Didymoplexis*, *Griff.*  
*Codonorchis*, *Lindl.*  
*Arethusa*, *Gronov.*

\* *Haplostellis*, *A. Rich.*

*Cleistes*, *Rich.*

*Calopogon*, *R. Br.*  
*Cathea*, *Salisb.*  
*Crybe*, *Lindl.*

#### GASTRODIDÆ.

*Gastrodia*, *R. Br.*  
*Epiphanes*, *Blume*  
*Ceratopsis*, *Lindl.*

\* *Gamoplexis*, *Falc.*  
*Epipogon*, *Gmel.*

#### VANILLIDÆ.

\* *Cyathoglottis*, *Pöpp et*  
*Endl.*  
*Sobralia*, *Ruiz et Pav.*

*Epistephium*, *H. B. K.*  
*Erythrorchis*, *Blume.*  
*Cyrtosia*, *Blume.*

*Vanilla*, *Swartz.*  
\* *Pogochilus*, *Falcon.*

#### VI. NEOTTEÆ.

CRANICHIDÆ. *Lindl.*  
*Ponthieva*, *R. Br.*  
*Schmelenia*, *Klot.*

*Pterichis*, *Lindl.*  
*Acræa*, *Lindl.*  
*Cryptostylis*, *R. Br.*

\* *Zosterostylis*, *Blum.*  
*Gomphichis*, *Lindl.*  
*Stenoptera*, *Lindl.*

*Attensteinia*, *H. B. K.*  
*Cranichis*, *Swartz.*  
*Tripleura*, *Lindl.*

*Chlorosa*, *Blum.*  
\* *Rophostemon*, *Blum.*  
*Cordyla*, *Blume.*

\* *Caloglossum*, *A. Rich.*  
\* *Ocampo*, *A. Rich.*  
*Prescottia*, *Lindl.*

*Decaisnea*, *Brongn.*  
LISTERIDÆ. *Lindl.*  
*Listera*, *R. Br.*

*Diphyllyum*, *Raf.*  
*Neottia*, *R. Br.*  
*Neottidium*, *Lk.*

*Calochilus*, *R. Br.*  
*Epipactis*, *Hall.*  
*Serapias*, *Pers.*

SPIRANTHIDÆ. *Lindl.*  
*Cnemidia*, *Lindl.*  
*Dreissena*, *Klot.*

*Spiranthes*, *L. C. Rich.*  
*Ibidium*, *Salisb.*  
*Cyclopogon*, *Presl.*

*Gyrostichus*, *Pers.*  
*Stenoptera*, *Presl.*  
*Sarcoglottis*, *Presl.*

*Cordylestylis*, *Falc.*  
*Stenorrhynchus*, *Rich.*  
*Sauroglossum*, *Lindl.*

*Pelexia*, *Poit.*  
*Synassa*, *Lindl.*

PHYSURIDÆ. *Lindl.*  
\* *Plexaure*, *Endl.*  
*Chloidia*, *Lindl.*

*Zeuxine*, *Lindl.*  
*Adenostyles*, *Blume.*  
*Cionisacous*, *Kuhl.*

\* *Charadrolepteron*, *Schr.*  
*Monochilus*, *Blume.*  
*Haplochilus*, *Endl.*

*Cheirostylis*, *Blume.*  
*Myoda*, *Lindl.*  
*Hæmaria*, *Lindl.*

*Hylophila*, *Lindl.*  
*Ætheria*, *Blum.*  
*Platyplepis*, *A. Rich.*

*Goodyera*, *R. Br.*  
*Leucostachys*, *Hffg.*  
*Gonogona*, *Lk.*

*Tussacia*, *Rafin.*  
\* *Eucosia*, *Blume.*



<i>Goethea</i> , Lindl.	<i>M. ...</i> , Poir.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>M. ...</i> , Blume	<i>... ..</i> , Kuhn	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>Tropid. ...</i> , Lindl.	<i>... ..</i> , Kuhn	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>Phlog. ...</i> , Schum.	<i>... ..</i> , Poir.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>... ..</i> , Hook.	<i>... ..</i> , Thunb.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>... ..</i> , Thunb.	<i>... ..</i> , Thunb.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>... ..</i> , Blume	<i>... ..</i> , Thunb.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>... ..</i> , W. & A.	<i>... ..</i> , R. Br.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>... ..</i> , Kuhl.	<i>... ..</i> , R. Br.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>... ..</i> , Blume	<i>... ..</i> , Lindl.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone
<i>Phlog. ...</i> , P. & A.	<i>... ..</i> , R. Br.	<i>... ..</i> , Thunb.	<i>... ..</i> , Gussone

Not known. (Guss. Arch. Sp. 3099.)

*... ..*

Position. — Apotestaceous. — Orchidaceæ. — *... ..*  
*... ..*

Since the foregoing remarks were written, much has been added to our knowledge of the order, but little to the theory of structure. It is therefore possible, or which a general classification should be founded.

I have pointed out (*Palae-Orchidaceæ*, under *Zygostates*) that the calli or stamens on the labellum have probably a much earlier origin than is generally supposed.

Dr. R. Brown long since (*Wallich, Pl. Asiat. I. 7*) pointed out the possibility that the processes of the lip found in *Psephenus* and certain other genera, might represent staminal apparatus, completing the customary number of male parts (three) as Endogenæ. He even remarked that "perhaps it may be considered as situated on all cases where the labellum is furnished with a process, however minute, along one of its axis." I have not seen reason to express publicly an opinion as to that suggestion, not having succeeded in finding satisfactory evidence of its truth; on the contrary, it had appeared to me that the processes in question might as easily be referred to the stigma: I am, however, bound to admit that upon the whole there is an accumulation of facts so much in favour of the theory of the sagacious observer, that I am inclined to think that it becomes more and more probable. It is especially to be noted that the number of processes found on the lip is usually one, two, or three; the latter being the most common. In some instances, one may represent the front abaxial staminal organ, two may represent the two lateral ones, and three may represent them all. It is also remarkable that where three processes or three rows of processes are present, the two lateral are generally the largest, as if they represented a more vigorous series of development than that in the centre. To which it may be added, that where more than three rows of processes are present, nevertheless, the middle three seems fundamental. The scientific reader will readily understand this by reference to the accompanying diagram, in which the supposed inner series of staminalia is represented by three black dots (●), and the outer series by as many open dots (○).



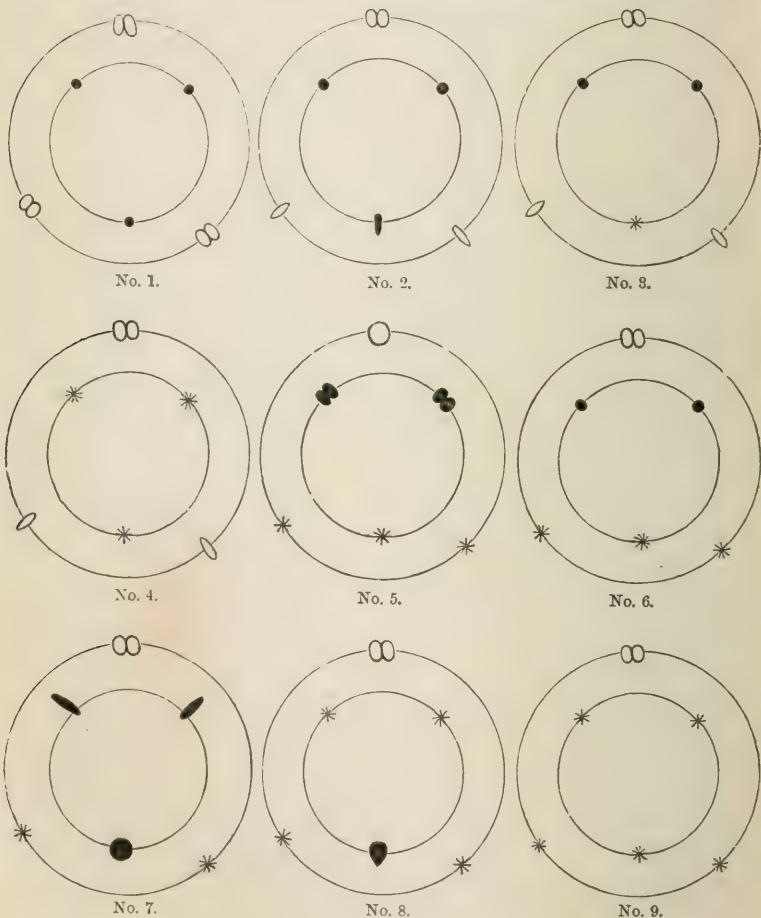
According to this theory the staminal apparatus of an orchid consists of two lines or whorls, each composed of three staminalia more or less developed. In general the central of the outer whorl is alone perfect, while in *Vriesea* perfection is confined to the two lateral inner staminalia. The part of the staminalia either wholly suppressed, as in many *Dendrobium*, or appear in the form of teeth in the column or crests upon the lip: the case of the *... ..* sometimes represents the lateral inner staminalia, and the crests of the lip being nothing more or less than outer and one central inner staminalia, as at others. Such evidence as exists upon this subject appears favourable to the opinion, which would be considerably strengthened if the crests of the lip were detached bearing pollen, a condition that has not yet been observed.

If this be so, the accompanying diagram will represent the position of the staminal apparatus in the different modifications which now obtain. In all cases but one, No. 5, the exterior ring represents the series to which the perfect stamen belongs, and the inner ring, that series which is usually more or less imperfect. For the convenience of description the perfect stamen and accompanying processes may be called the *outer stamen and staminalia*, while those of the second and more paradoxical series may be termed the *inner stamen and staminalia*. The asterisks indicate an entire suppression of staminalia.



No. 1 shows the theoretical state of the flower, with the three outer stamens complete, and three inner staminodes. The outer stamens are here in the condition in which they appear in the plant figured by Dr. Wight under the name of *Euproboscis*, and by Griffith in Falconer's *Dendrobium normale*.

No. 2 represents such genera as *Odontoglossum* in which one outer stamen is perfect, the two outer staminodes in the form of the lateral plates of the crest of the disk; then of the inner staminodes two form the wings of the column, and the other the midrib which separates or is blended with the lateral plates of the disk.



No. 3 represents such a structure as that of *Anacamptis*, where the usual outer stamen is attended by two of the inner staminodes, while two outer staminodes appear as plates on the lip, and the central of the inner staminodes is missing. *Solenidium* would also belong to this form.

No. 4 is the case of *Cymbidium* properly so called, in which all the inner staminodes are deficient, and the lateral outer staminodes lie upon the lip in the form of two raised lines.

No. 5 shows the beginning of the series in which outer lateral staminodes are wanting, except one which represents the perfect stamen in the preceding cases, while on the other hand the two lateral inner stamens are perfect and the third wanting; this occurs in *Cypripedium*.



No. 6. In *Orchis* the structure is absolutely reduced to one perfect outer stamen, and a pair of inner lateral stamens, occurring as tubercles at the base of the column, all the other staminal apparatus being missing. The pistil is simple here.

No. 7 shows what happens in *Zygostata* in which the outer lateral stamens are absent, but the whole of the inner ones are fully and densely developed. The extension of *Pterostylis* enters into the same category, although in some species the very different

No. 8 may be regarded as the expression of *Manisuris*, with all the stamens apparently gone except the usual outer stamen and the corresponding inner stamens in the form of a tumour on the lip.

No. 9, with every part wanting except the outer sexual stamens, shows again the structure of many *Dendrobium* and *Sarcopogon*.

The younger Reichbaldsch rather agrees at these specialities which apparently appear to be founded on sound principles, and it is clear that he does not understand the question as it has been put in English works.

The botanist just mentioned, in an ingenious dissertation on the External Orchid (*De pollinis Orchidearum sensu ac structura, et de Orchidibus ex affinis in pollinibus Reichbaldsch*, Leipzig, 4to, 1852,) proposes to take the position of the anther rather than the condition of the pollen as the foundation of a systematic arrangement. There does not, however, appear to be any advantage in the suggested change, which is in reality the same arrangement as the foregoing, with a different sequence. It seems at present to be premature to speak dogmatically upon this very difficult subject; and therefore I have avoided any alterations, and have merely in the following list added the names of such new genera as authors have proposed, without, however, by any means pronouncing upon their validity.

In addition to what has been above stated respecting the uses of Orchids, I may state that, according to Mr. Seemann, a species of *Sobralia* yields the Vanilla called *Chica* in Panama. The fruit of *Leptotes* is also succulent and fragrant; while in *Notylia* the fruit resembles small *Miscoto* berries in appearance, but are slightly aromatic.



Fig. 124.



Fig. 125.



## ADDITIONAL GENERA, &amp;c.

Duboisia, *Karsten.* = ? *Pleurothallis*.  
 Sigmatostalix, *Rchb. f.* near *Stelis*?  
 Aspegrenia, *Pöppig.* = *Ocoteeria*.

Acinia, *Griff.* near *Dendrochilum*.  
 Plexaure, *Endl.* near *Oberonia*.  
 Nephelaphyllum, *Bl.* = *Cytheris*.

Latouria, *Bl.* near *Dendrobium*.  
 Malachadenia, *Lindl.*  
 Didactyle, *Lindl.*  
*Xiphizusa*, *Rchb. f.*  
 Bolbophyllopsis, *Rchb. f.*  
 Taurostalix, *Id.*  
 Bolbophyllaria, *Id.*  
 Aerochane, *Lindl.*  
 Xiphosium, *Griff.* = *Eria*.  
 Coelia, *Lindl.*  
 Porpax, *Lindl.*  
*Agynanthus*, *Wight.*  
 Lichenora, *Wight.*

Neogyua, *Rchb. f.*  
 Androgyne, *Griff.*  
 Bolborchis, *Moritz.* = *Pleione*.

Pinelia, *Lindl.*  
 Hemiscleria, *Id.*  
 Oerstedella, *Rchb. f.*  
 Pseudepidendrum, *Rchb. f.*  
 Enothomea, *Rchb. f.* near *Alamania*.  
 Læliopsis, *Lindl.* near *Lælia*.

PHALUSEÆ, *Blume.* = *Bletidæ*.  
 Calelyna, *Rchb. f.*  
 Thunia, *Id.*

Orthochilus, *A. Rich.* = *Eulophia*.  
 Hypodematum, *Id.* = *Cyrtopera*?  
 Stauroglottis, *Schauer.* = *Phalenopsis*.  
 Arhynchium, *Lindl.* near *Saccolabium*.  
 Cottonia, *Wight.*  
 Pattonia, *Id.*  
 Wailesia, *Lindl.*  
*Leopardsanthus*, *Bl.*  
 Ornitharium, *Lindl.*  
 Listrostachys, *Rchb. f.* near *Angraecum*.  
 Josephia, *Wight.* near *Glomera*?

Schlimmia, *Linden.* near *Cryptochilus*.

Hyacinthorchis, *Bl.* = *Cremastra*.  
 Cyperorchis, *Bl.* near *Cymbidium*.  
 Trophianthus, *Schwein.* = *Aspasia*.

Eriopsis, *Lindl.*  
 Pseuderriopsis, *Rchb.*  
 Bractia, *Id.*  
 Chondrorhyncha, *Lindl.*  
 Dignathe, *Lindl.*  
 Cochlioda, *Lindl.*  
 Solenidium, *Lindl.*  
 Miltoniastrum, *Rchb. f.*  
 Rhynchostele, *Rchb. f.*  
 Abola, *Lindl.*  
 Oncodia, *Lindl.*

} near *Helcia*.

} near *Odontoglossum*.

Stanhopeastrum, *Rchb. f.* near *Stanhopea*.  
 Lycopodium, *Id.* near *Acineta*.  
 Mormolyce, *Fenzl.* = *Trigonidium*.  
 Warzewiczella, *Rchb. f.*  
 Kefersteinia, *Id.*  
 Paradisanthus, *Id.*  
 Acacallis, *Lindl.*  
 Cheiradenia, *Id.*  
 Cryptosanus, *Scheidw.*  
 Ione, *Lindl.*  
 Orchidofunkia, *Rich.* = *Cryptarrhena*.

} near *Warrea*.

} near *Maxillaria*.

Erycina, *Lindl.* near *Zygostates*.  
 Euproboscis, *Wight.*  
 Hofmeisterella, *Rchb. f.* near *Telopogon*.

Mesospinidium, *Rchb. f.*  
 Neodryas, *Id.*  
 Cohnia, *Id.*  
 Papperitzia, *Id.*  
 Plectrophora, *Focke.* = *Trichocentrum*.

Tinea, *Bivona.*  
*Neotinea*, *Rchb. f.*  
 Thisbe, *Falconer.*  
 Charadrolepton, *Schauer.* = *Glossula*.

} near *Aceras*.

Deroemera, *Rchb. f.* near *Herminium*.  
 Cybele, *Falconer.* = *Peristylus*.  
 Lindblomia, *Fries.* = *Cœloglossum*.

Schizochilus, *Soudr.* near *Disa*.

Bieneria, *Rchb. f.* near *Bipinnula*.  
 Adenochilus, *Hook. fil.* near *Caladenia*.

Nematoceras, *Hook. fil.* near *Corysanthes*.



Fig. 124 d.



Fig. 124 c.



*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*

*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*

*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*  
*Phaiosiphon* *Blanchardii* (Pursh) *Blanchardii*



FIGURE 1



## ORDER LIII. APOSTASIACEÆ.—APOSTASIADS.

Apostasiæ, *Lindl. Nixus Plantarum*, p. 22. (1833); *Blume in Ann. Sc. Nat. Ser. 2. 2. 91.* (1834); *Endl. Gen. lxxvii.*; *Meisn. p. 387.*

DIAGNOSIS.—*Orchidal Endogens with regular half-gynandrous flowers, and axile placentæ.*

Perennial herbaceous plants. Stem simple or branched. Leaves firm, thin, sheathing at the base. Flowers in simple or compound terminal racemes. Calyx and corolla each consisting of 3 similar pieces. Anthers 2 or 3, sessile upon a short column, erect, pollen cohering in 3s or 4s according to Mr. Bauer (*Illust. Fruct. t. 15*),—in single oval grains with a longitudinal furrow according to Mr. Griffith (*Letter dated Merqui Dec. 28, 1834*) and Blume. Ovary 3-celled, with 3 polyspermous placentæ in the axis; ovules with their integuments very distinct and much shorter than the protruded nucleus (*Griffith*); style filiform, with a slightly 3-lobed stigma as long as the anthers, and adhering with their filaments into a short column. [Capsule 3-celled, 3-valved; the valves bearing the dissepiment in the middle, but cohering at the apex and base. Seeds very numerous, minute, ovate, and with a skin fitting the nucleus, or scobiform with a membranous testa loose at each end.—*Blume.*]

Very closely allied to Orchids, from which they differ essentially in having a 3-celled fruit, with loculicidal dehiscence, and in the style being altogether free from the stamina for the principal part of its length. At the same time the structure is gynandrous enough to afford a clear distinction from the Burmanniads. There are many admirable observations upon *Apostasia* itself in Brown's *Observations on the organs and mode of fecundation in Orchideæ and Asclepiadæ*, and some further information is given by Blume in the place above quoted. The Order seems as if connecting Orchids and Hypoxids. If *Rhyncanthera* is correctly represented by Blume, its 3-locular ovary will refer it here, while the structure of its column would keep it in Orchids. The essential character is, however, framed without reference to it.

Found in damp woods in the hotter parts of India.

No uses have been assigned to any of them.

## GENERA

*Apostasia*, *Bl.*  
*Mesodactylus*, *Wall.*

*Neuwiedia*, *Bl.*

?*Rhyncanthera*, *Bl.*

NUMBERS. GEN. 3. Sp. 5.

*Hypoxidaceæ.*

POSITION.—*Orchidaceæ.*—*APOSTASIACEÆ.*—

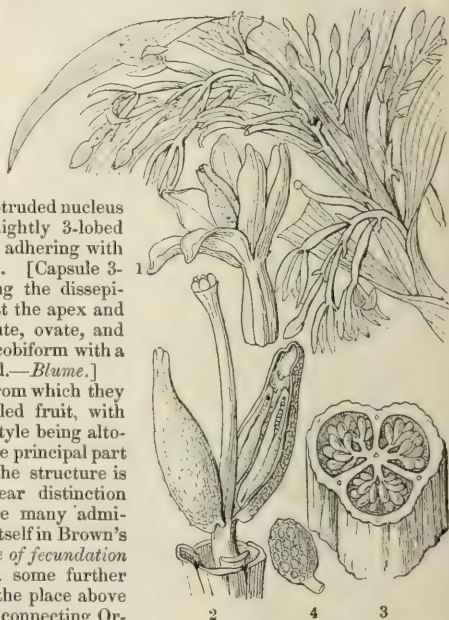


Fig. CXXV.

Fig. CXXV.—*Apostasia odorata*; 1. a flower; 2. the stamens and style; 3. a cross section of the ovary; 4. a seed.



## ALLIANCE XIV. XYRIDALES. THE XYRIDAL ALLIANCE.

DIAGNOSIS.—*Hypericum linearis*, *tripetalus* or *hexamerus*, with *xyridal alliance*.

It is in this Alliance that, among Endogens with a free ovary, the first distinct separation of a corolla from the calyx takes place, in the form of (V or) 4 petals. Hence the essential character of the Alliance is its tripetalalous condition. In the absence of that circumstance it is not to be distinguished from Juncals on the one hand, or Liliaceæ on the other. The Waterworts (Phylodraceæ) seem to have anticipated the tripetalalous organization by forming petals before sepals, and hence they present the anomaly of a flower with a very conspicuous corolla having no calyx, the office of which appears to be performed by spathaceous bracts. Nyrids resemble Sedges with a corolla, and are no doubt akin to Pipeworts (Eriocaulaceæ). Spiderworts are analogous to Fumars among Dietyogens, and as for the Mayacs they may be compared to Lepanthes among Pontederas, or to Potamogeton among the Arrow-grasses.

## NATURAL ORDERS OF XYRIDALS.

<i>Sepals</i> 0. <i>Petals</i> 2. <i>Stamens</i> 3, of which 2 are abortive. <i>Embryo axile, in fleshy albumen</i> . . . . .	} 14. PRILEURACEÆ.
<i>Sepals</i> 3. <i>Petals</i> 3. <i>Stamens</i> 3 fertile. <i>Corolla opposite sepals. Placentæ parietal. Embryonacule on the outside of fleshy albumen</i> . . . . .	
<i>Sepals</i> 3. <i>Petals</i> 3. <i>Stamens</i> 6 (or 3). <i>Corolla opposite sepals. Placentæ axile. Embryo trochlear, half immersed in fleshy albumen</i> . . . . .	} 15. XYRIDACEÆ.
<i>Sepals</i> 3. <i>Petals</i> 3. <i>Stamens</i> 6 (or 3). <i>Corolla opposite sepals. Placentæ parietal. Embryo axile, on the outside of fleshy albumen</i> . . . . .	
<i>Sepals</i> 3. <i>Petals</i> 3. <i>Stamens</i> 3; (others abortive). <i>Corolla opposite petals. Placentæ parietal. Embryo axile, on the outside of fleshy albumen</i> . . . . .	} 16. MAYACEÆ.
<i>Sepals</i> 3. <i>Petals</i> 3. <i>Stamens</i> 3; (others abortive). <i>Corolla opposite petals. Placentæ parietal. Embryo axile, on the outside of fleshy albumen</i> . . . . .	



## ORDER LIV. PHILYDRACEÆ.—WATERWORKS.

Philydræ, *R. Br.* (1832?); *Lindl. Nixus*, 22. (1833); *Endl. gen. lii.*; *Meisner*, p. 406; *Kunth Enum.* 3. 379.

DIAGNOSIS.—*Xyridal dipetalous Endogens without a calyx, with 3 stamens of which 2 are abortive, and an embryo in the axis of fleshy albumen.*

Root fascicled-fibrous. Stems erect, simple, leafy, often woolly. Leaves ensiform,



Fig. CXXVI.

somewhat cellular, equitant with their half-sheathing bases. Spikes terminal, simple or divided. Flowers alternate solitary, sessile, subtended by a spathaceous persistent bract, yellow, scentless. Calyx abortive. Corolla 2-leaved, coloured, withering. Filaments 3, united at the base, inserted into the base of the lower leaf of the perianth; the lateral ones petaloid and sterile; anther with distinct cells. Ovary superior; style simple; stigma capitate; ovules numerous, on narrow, parietal or axile placentæ, horizontal, anatropal. Capsule 3-celled, 3-valved; the valves having the partition in their middle. Seeds numerous, minute, horizontal; their skin thick; with the embryo in the axis of fleshy albumen.

These are herbaceous plants, having the great spathaceous bracts of a plant of the Musads, combined with the habit of Sedges; and at the same time having a flower like that of a Spiderwort, minus its calyx and one petal. It is uncertain what the exact analogy of its petaloid divisions may be; but they appear to belong to the corolla. Brown regards the Waterworks as having some relation to Burmannia, and even to Orchids, on account we presume of the constant abortion of 2 out of the 3 stamens. Their nearest relationship, however, is plainly with Xyrids and Spiderworts, from the former of which they differ in the want of a glumaceous calyx, and from both in the large embryo lying in the axis of the albumen.

The only plants of this Order yet discovered are found in New Holland, Cochin-China, and China.

Nothing is known of any use to which they may be applied.

GENERA.

Philydrum, *Banks.*

Garciana, *Lour.*

Hetæria, *Endl.*

NUMBERS. GEN. 2. Sp. 2.

*Orchidaceæ.*

POSITION.—Commelynacæ.—PHILYDRACEÆ.—Xyridaceæ.



Fig. CXXVII.

Fig. CXXVI.—A seed of *Philydrum lanuginosum*, divided perpendicularly so as to show the embryo.  
Fig. CXXVII.—1 *Hetæria pygmaea*; 2. a flower; 3. the fertile stamen and two lateral sterile ones; 4. a cross section of the ovary.



## ORDER LV. NYRIDACEAE—Nymphaeaceae

[illegible]

**Diagnosis.**—Xenodol *Euchromia*, with 5 separate spines (the caudate spine, 2 short ones, 1 penultimate pharyngeal, and 1 apical) on the caudal peduncle.

Herbaceous, sedgey plants with fibrous roots. Leaves radical, numerous, linear with enlarged scarious sheathing bases. Flowers in terminal, branched,

Sepals 3, glumaceous. Petals 3, thin, long, and coloured, united into a monopetalous corolla. Fertile stamens 3, inserted up in the claws of the petals; anthers turned outwards, 2-celled; sterile stamens alternate with the petals. Ovary single, 1-celled, with parietal placentae; ovules numerous, orthotropical; style trifid; stigmas obtuse, multifid, or unclivoid. Capsule 1-celled, 3-valved, many-seeded, with parietal placentae. Seed with the embryo on the outside of the fleshy albumen, and at the end most remote from the hilum.

These plants seem to be the habit of Sedges and other glumaceous plants, the floral character of Spider-worts; and this circumstance alone would lead to the supposition that they form a peculiar natural Order. They are brought into contact with the Aphyllanthaceæ by means of the genus *Baria*, which is so intermediate between the Orders that it is hard to say to which it belongs. The *Nyctids* were united with *Ruelliacæ* by Brown and others, but separated as a distinct Order by Agardh and Desfont., and they appear to be essentially distinguished by the higher development of their floral envelopes, a character which must be regarded as more important than the mere accordance in the structure of the seed, in consequence of which chiefly they have been retained in *Ruelliacæ*. *Rapatea* and *Dasyogon* are so imperfectly described that it is impossible to say where they belong; but their habit refers them either here or to the *Ruelliacæ*.

All are natives of the hotter parts of the world, chiefly in the tropics of America, Asia, and Africa. Two or three species of *Nyctea* are found in the southern states of North America.

The leaves and root of *Nyctis indica* are employed as a tonic and leprosy in India; *N. americana* is used for the same purposes in Guiana, and *N. vaginata* in Brazil.

## GENERAL

Types, I and II, in the  
 collection, Willd.

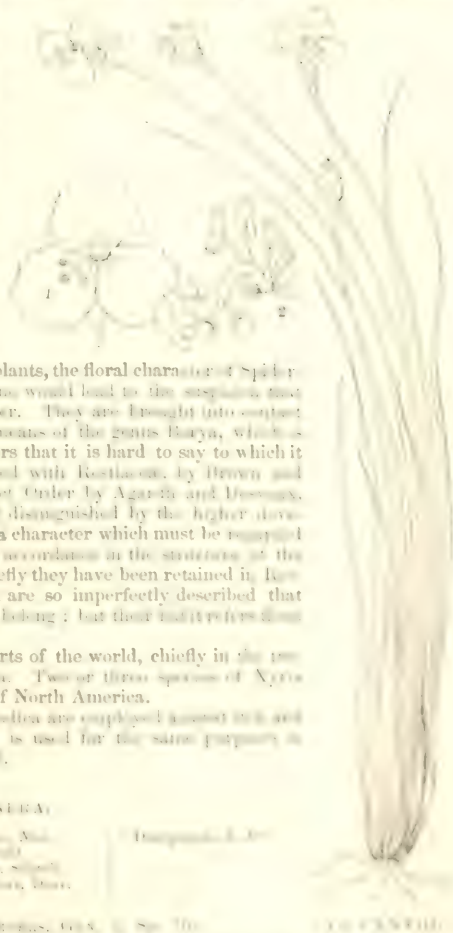
\* Corresponding author; Tel.: +91 80 2676 5222.  
E-mail address: siddhartha@rediffmail.com.

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August 1908

Position.—MAYAGÜEZ, N. Y. RICHMOND, C. S. GONZALEZ.

Fig. CXXVIII.—*Nyctis opteculata*, ♀, a 3000 feet high tree, 1. 4000 feet high tree.





## ORDER LVI. COMMELYNACEÆ.—SPIDERWORTS.

*Ephemereæ*, *Butsch. Tab. Affin.* 125. (1802) in part.—*Commelyneæ*, *R. Brown Prodr.* 268. (1810); *Richard in Humb. Bonpl. N. Gen.* 1. 258. (1815); *Agardh Aph.* 168. (1823); *Kunth. Enum.* 4. 34.—*Commelyneæ*, *Ed. prior. Endl. Gen.* xlviii.; *Meisner, Generavp.* 406.—*Flagellariæ*, *Endl. Gen.* p. 131.

**DIAGNOSIS.**—*Xyridal Endogens*, with 3 sepals opposite the carpels, 3 petals, 6 (or 3) stamens, axile placentæ, and a trochlear embryo half immersed in fleshy albumen.

Herbaceous plants. Leaves flat, narrow, usually sheathing at the base. Sepals 3, distinct from the petals, herbaceous. Petals coloured, sometimes cohering at the base. Stamens 6, or a smaller number, hypogynous, some of them either deformed or abortive; anthers 2-celled, turned inwards. Ovary 3-celled, with few-seeded cells; style 1; stigma 1. Capsule 2- or 3-celled, 2- or 3-valved, the valves bearing the dissepiments in the middle. Seeds often twin, inserted by their whole side on the inner angle of the cell, whence the hilum is linear, with a papilla covering over the embryo; embryo pulley-shaped, antitropal, lying half-buried in a cavity of the albumen remote from the hilum; albumen densely fleshy.

The Spiderworts are plants which exhibit a transition from the first remove out of the regions of sedge-like plants to the true Lilies. In other words, while Xyrids are glumaceous herbs with their perfectly-formed petals, there are Xyrids with the glumaceous structure gone, and the Liliaceous peculiarities gained: all but the long axil embryo and the petaline condition of the calyx. Brown compares them with Rushes, observing that they are very different both in habit and structure; agreeing better with Restiaceæ in the situation of the embryo and the sheathing leaves, although otherwise quite distinct; they have scarcely any affinity with Palms, except in the trochlear embryo, remote from the hilum, and indicated in both Orders by an external papilla. The Spiderworts may also be compared with Alismads, which are equally tripetaloidous, and with Mayacs, which have 1-celled anthers, a wholly cellular structure, and, as they say, the carpels opposite the petals.

Chiefly found in the East and West Indies, New Holland, and Africa. A few occur in North America, but none in Northern Asia or Europe.

Concerning their uses there is little to relate. The fleshy rhizomes of *Commelyna cœlestis*, *tuberosa*, *angustifolia* and *striata*, contain a good deal of starch mixed with mucilage, and are therefore fit for food when cooked. The Chinese employ those of *C. medica* in cough, asthma, pleurisy, strangury, and dysury. *Tradescantia diuretica* has a similar application in Brazil. A decoction of *Cyanotis axillaris* is drunk in the East Indies in cases of tympanis, and *Tradescantia Malabarica* is administered in the same country, boiled in oil, as a remedy for itch and leprosy. *Murdannia scapiflora* is said by Dr. Royle "to have some repute in Hindoo Materia Medica." *Commelyna Rumphii* is held in India to be emmenagogue. The leaves of *Flagellaria indica* are said to be astringent and vulnerary.

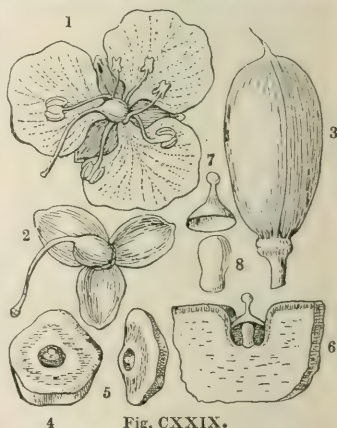


Fig. CXXIX.

## GENERA.

*Commelyna*, Dillen.  
*Hedwigia*, Medik.  
*Leechea*, Lour.  
*Ananthopus*, Raf.  
*Aneilema*, R. Br.  
*Aphilara*, Salisb.  
*Polyspatha*, Benth.  
*Floscopa*, Lour.  
*Dithyrocarpus*, Kth.

*Palisota*, Reichenb.  
*Pollia*, Thunb.  
*Actisia*, E. Mey.  
*Lamprocarpus*, Blum.  
*Callisia*, Lfth.  
*Haploanthus*, Jacq.  
*Murdannia*, Royle.

*Tinnantia*, Scheidw.  
*Tradescantia*, Linn.  
*Ephemeron*, Tournef.  
*Spironema*, Lindl.  
*Cyanotis*, Don.  
*Zygomanes*, Salisb.  
*Lampra*, Benth.

*Campelia*, Rich.  
*Zanonina*, Plum.  
*Dichorisandra*, Mik.  
*Cartonema*, R. Br.  
*Forrestia*, A. Rich.  
*Flagellaria*, L.  
*Streptolirion*, Edgno.  
*Heteracthia*, Knze.  
*Rhæo*, Hance.

NUMBERS. GEN. 16.—Sp. 260.

Liliaceæ.

POSITION. ———. —COMMELYNACEÆ.—Xyridaceæ.

Bromeliaceæ.

Fig. CXXIX.—*Aneilema crispatum*; 1. a flower; 2. the calyx and pistil; 3. the capsule; 4, 5. seeds; 6. a section of ditto showing the embryo; 7. the papilla; 8. the embryo.—*Ferd. Bauer.*



## ORDER LVII. MAYACELÆ.—MAYACEÆ.

Mayaceæ, Kunth, *Enum. v.*, p. 1113.

DIAGNOSIS. — *Xyridal Endopogon*, with 3 sepals alternate with the corolla, 3 petals, 3 anthers, 1-celled anthers, parietal placentar, and a sessile ovule in the middle of their albumen.

Moss-like plants, creeping over damp places, almost entirely destitute of aerial branches. Leaves very narrow, pallid, undivided. Flowers  $\frac{1}{2}$ , small, white, pink, or violet. Sepals valvate? herbaceous. Petals much longer, imbricated. Stamens 3, inserted into the base of the sepals; anthers 1-celled, adhering by the base to a thread-like filament, opening at the point only. Carpels 3, alternate with the sepals, combined into a 1-celled ovary; placentar 3, parietal; ovules sessile, horizontal, orthotropal; style thread-like; stigma simple. Capsule membranous, covered by the permanent sepals and petals, 1-celled, 3-valved; seeds attached to the middle of the valves, roundish, ribbed, terminated by a conical tubercle. Albumen shaped like the seed, composed of angular crystal-like cells, arranged in a radiant manner. Embryo very minute, antitropal, half plunged in the vertex of the albumen.

Such appears to be the structure, according to Kunth, and Schott, and Endlicher, of a few plants which are separated from the Spiderworts by the former of these botanists. They are very little known, and demand a fresh examination, but in the meanwhile appear to be distinguished from the Spiderworts by their peculiar habit, their 1-celled anthers, and their carpels being opposite the petals (according to Schott and Endlicher), while, on the other hand, the Xyrids are distinguished by their monopetalous glumaceous capitate flowers and 2-celled anthers. There is, however, but little other difference, unless the valvate calyx of the Mayaceæ and the position of their carpels should afford additional characteristics. Thus, however, it is to be noted, that the figures given by the last mentioned botanists are at variance with those account of the position of the carpels. No spiral vessels were detected by Schlecht in the leaves and stems of *Mayaca fluviatilis*, except in the flower-stalks. — *Wieg. Arch.* v. 231.

The few species that are described inhabit the marshes of America, from Brazil up to Virginia.

They are of no known use.

## GENERA.

*Mayaca*, Willd.  
*Dactyloctenium*, Vahl.  
*Suaeda*, Schreb.  
*Gracilaria*, Lamour.

NUMBERS. GEN. I. Sp. 4.

POSITION.—Commelyneæ. MAYACELÆ. Xyridales.

Fig. CXXX.—*Mayaca Vaseghii*. 1. a flower. 2. a longitudinal section of the same. 3. a single seed. 4. two seeds, one of which is cut perpendicularly in order to show the embryo.



### ALLIANCE XV. *JUNCALLES*.—THE JUNCAL ALLIANCE.

DIAGNOSIS.—*Hypogynous, bisexual, scaly or scarious flowered Endogens, with abundant albumen.*

This and the Xyridal Alliance stand on the same line in the scale of organization. They both consist of Endogens, which are equally related to Orders of a very low and very high structure. The Juncals approach Grasses and their allies in the glumaceous character of their calyx and corolla, the Xyrids in that of their calyx and bracts. Some of them are absolutely without floral envelopes, the majority have those organs in the form of inconspicuous scales, and when colour or a petaline condition appears among them, the parts in which it occurs are dry and sapless, as if they were mere membranes or attempts at the organs they represent. The Rushes have a very minute embryo, wholly destitute of all appearance of a plumule; Orontiadæ have the cleft of an Arum, through which a plumule is easily found. The great exception to their character consists in the absence of albumen from the seeds of a few genera among the Orontiadæ; but such plants are readily known by their spadiceous inflorescence from the exalbuminous Alismal Alliance.

#### NATURAL ORDERS OF JUNCALS.

- Flowers scattered. Embryo minute, undivided* . . . . . 58. JUNCACEÆ.  
*Flowers spadiceous. Embryo axile, with a conspicuous cleft on one side.* 59. ORONTIACEÆ.



## ORDER LVIII. JUNCACEÆ.—Rushes.

*Juncus*, *Juncus*, Gen. 1759, in part. *Juncus*, DC. Prodr. 3, 1825 (1830). *J. Juncea*, Presl, 1807, in part. *Juncaceæ*, *Apocyn. Aphyllæ*, Loh. (1824), in part. *Juncaceæ*, *Mon. Bot. 33*, 1825, in part. *Juncaceæ*, *Presl, Bot. 3*, 206. Kuhnianæ, Celsianæ, Nædleræ, *Presl, 3*, 206.

DIAGNOSIS. *Juncus* Endogens, with scattered flowers and a minute seedling embryo.

Herbaceous plants, with fascicled or fibrous roots. Leaves fascicled, or flat and channelled with parallel veins. Inflorescence often branched or less capitate. Flowers generally brown or green, in umbels, racemes, or long compact spikes, or even panicles, 2-ly and corolla forming an inferior, 6-parted, more or less glumaceous or cartilaginous, perianth. Stamens 6, inserted into the base of the segments; sometimes 3, and then opposite the calyx. Anthers 2-celled, turned inwards, opening longitudinally, or by pores at the points. Ovary 1- or 3-celled, 1- or many-seeded, or 1-celled and 2-seeded; style 1; stigmas generally 3, sometimes only 1; ovules anatropal. Fruit capsular, with 3 valves, which have the dissepiment in their middle, sometimes destitute of valves, and 1-seeded by abortion. Seeds with a thin skin; albumen firm, fleshy, or cartilaginous; embryo very minute, included, near the hilum.

This Order, in its most genuine state, may be said to stand between petaloidous and glumaceous Endogens, agreeing with the former in the floral leaves having assumed the verticillate state necessary to constitute a perianth, and with the latter in their texture. But while a glumaceous confused calyx and corolla are the characteristic of one part of the Order, another part, approaching Lilyworts, assumes a petaloid state; so that little is finally left to separate Rushes from the latter, except the difference in the embryo, which is extremely small in Rushes, and large and axile in Lilies. It is in fact by this last character, more than by any other, that the Order seems to be distinguished; for otherwise, *Narthecium* would go to Lilies, and all the *Aphyllanthous* Lilies would come to Rushes. The genera are in great need of careful revision; of several the embryo is unknown, and it may be found hereafter necessary to make considerable alteration among them: but till the whole history of the above genera shall have been cleared up, it is at least premature to create more Orders for their reception. I do not discover a single feature in *Xerotes* which can divide it from Rushes proper, and as to *Flagellaria*, equally made the usurper of a throne that cannot be maintained, it seems a mere runaway from the Spiderworts, differing very little from *Aneilema*. Some of the species of this Order are remarkably unlike European Rushes. The *Prostrum Palmæ* of the Cape of Good Hope, has the look of an *Aloe*, or of the crown of a *Pine apple*, mounted upon a thick black spongy stem. *Kungia* has an arborescent stem terminated by a tuft of leaves. *Calectasias* are branched herbs, with dry, permanent, starry flowers, of a bright violet, and anthers opening by pores, like a *Solanum*. According to Brown (*Hortus London Journal*, 2, 404.), the genera *Kungia*, *Dasypogon*, *Calectasia*, *Xerotes*, and *Baxteria*, form a peculiar tribe of this Order; but no character is assigned to such tribe. I cannot, however, exclude *Dasypogon*. Brown remarks, that Rushes are intermediate between *Restiaceæ* and *Asphodelæ*, differing from the former in having an included embryo, a radicle usually centripetal, and the anthers, when there are only 3, opposite the sepals. Against such Rushes, *Calectasia* and *Rushes*, *Agk.* 157. From *Palmæ* they are distinguished, independently of their habit, by the texture of the perianth, by the constant tendency to produce more than 1 ovule to each cell, and by the minute

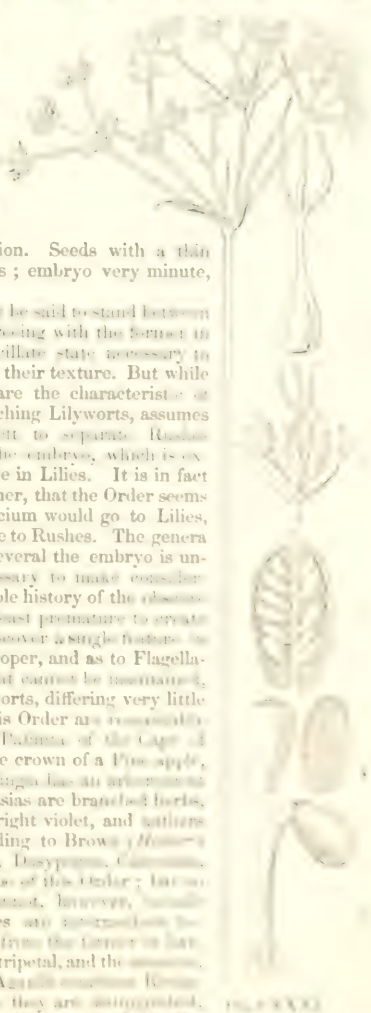


Fig. CXXXI.—*Juncus acutiflorus*. 1. a flower. 2. the pistil. 3. a longitudinal section of the ovary. 4. seeds. 5. a seed germinating.



being remote from the hilum. *Juncus* is an instance of a monocotyledonous plant having distinct pith. "Xerotes, in the structure and appearance of its flowers, and in the texture of albumen, has a considerable resemblance to Palms, but it wants the peculiar characters of the seed, and also the habit of that remarkable Order."—*Brown in Plinders*, 578.

Chiefly found in the colder parts of the world, some even in the coldest, two existing in the ungenial climate of Melville Island. Several, however, are known in the tropics. Eight are mentioned as inhabiting the tropical parts of New Holland alone. According to Humboldt they constitute  $\frac{1}{400}$  of the flowering plants in the equinoctial zone; in the temperate zone,  $\frac{1}{80}$ ; in the frozen zone  $\frac{1}{25}$ ; in North America,  $\frac{1}{150}$ ; in France,  $\frac{1}{86}$ . In Sicily, according to Presl, they do not form more than  $\frac{1}{308}$ .

Only employed for mechanical purposes, as the Rush and others for making the bottoms of chairs, &c.; the pith of the same for the wick of common candles. One species is cultivated in Japan like Rice, entirely for making floor-mats.—*Thunb.* The blanched portion of the base of the inner leaves of some Rushes, and of *Astelia alpina*, a sedgy plant, which grows on the sand-hills of the coast of Tasmannia, and has the mature leaves an inch wide, and of a deep green, are eatable, and of a nutty flavour. The flowers resemble those of Rushes. They grow in clusters, on a stem as flat and broad as the leaves.—*Backhouse.* The roots of *Luzula campestris*, and several Rushes, have a popular reputation as diuretics, and are used as such in the north of Europe and China. The herbage of *Narthecium ossifragum* was once regarded as a vulnerary. Susum, a Java plant, supposed to be near *Xerotes*, has anthelmintic roots employed in veterinary practice. Dr. J. Hooker observes, that in some species of this Order the outer membrane of the seeds forms with water a transparent jelly similar to what is seen on the moistened grains of some Composite plants.

#### GENERA.

*Luzula*, DC.  
*Luciola*, Smith.  
*Prionium*, E. Mey.  
*Juncus*, DC.  
*Distichia*, Nees.

*Rostkovia*, Desv.  
*Marsippospermum*,  
Desv.  
*Narthecium*, Moench.  
*Abama*, Adans.

*Cephaloxys*, Desv.  
*Susum*, Bl.  
*Xerotes*, R. Br.  
*Lomandra*, Lab.  
*Astelia*, Sol.

*Hamelinia*, A. Rich  
? *Funkia*, W.  
*Hanguana*, Bl.  
*Kingia*, R. Br.  
*Baxteria*, R. Br.  
*Calectasia* R. Br.

NUMBERS. GEN. 13. Sp. 200.

*Liliaceæ.*

POSITION.—*JUNCACEÆ.*—*Orontiaceæ.*

*Cyperaceæ.*

#### ADDITIONAL GENERA.

? *Goudotia*, Desv.  
*Saxo-Fridericia*, Schomb.

*Rapatca*, Aubl.  
*Spathanthus*, Desv. } See p. 187.  
*Hamelinia*, Ach. Rich. near *Astelia*.

Adolphe Brongniart and Dr. Hooker regard *Astelia* as the type of a distinct Natural Order, *ASTELIÆÆ.*—*Flora Antarc.*, ii. 357.



## ORDER LIX. ORONTIACEÆ. — COMPOSITÆ.

Orontiaceæ, R. Brown, *Prodr.* 767. (1810). *Endl. Gen.* p. 229. *Ann. Mag. Nat. Hist.* 1810. 2. 369. — *Endl. Gen.* p. 229. 1840. — *Moench, p. 306.* — *Sprengel, Bot. Aph. 12.* 1822. — *Walt. Meibem.* 22. (1822). — *Asch. & Speg.* 114. — *Asch. & Speg.* 114.

DIAGNOSIS.—*Juveal End. gen.*, with spathe, and the male calyx with a distinct, cleft.

Herbaceous plants, with broad entire or deeply divided leaves, which however are occasionally sword-shaped and equitant. Some of them are stemless, others ascending over trees, to which they adhere by creeping roots; a few are aquatic. Flowers  $\frac{1}{2}$ , on a simple spadix, furnished with a spathe, white, green, or purple. Calyx and corolla absent, or consisting of 4, 5, 6, 8 scales. Stamens of the same number, either hypogynous or perigynous; anthers 2-celled, opening longitudinally or transversely. Ovary free, with 1 or more cells; ovules erect, anatropal or campylotropal, or pendulous and orthotropal; stigma capitate, sessile, or furnished with a subulate style. Fruit a berry. Embryo situated on one side, in the axis of fleshy, or horny, or mealy albumen. (Albumen absent in *Scindapsus*, *Dracontium*, *Symplocarpus*, *Orontium*.—*Endl.*)

The greater part of these plants have the habit of Arads, with which they are usually associated, and from which in fact they differ only in having hermaphrodite flowers, which have usually a sealy perianth. For this reason other Botanists separate them, and it seems more especially desirable to do so, because there is no tendency among them to a separation of the sexes. *Acoreæ* are indeed usually regarded as the type of a peculiar Order; and if this opinion is correct, the Orontials must certainly accompany them, for they differ in nothing except the form of their leaves, which, in *Acoreæ*, are sword-shaped and straight-veined. In fact, *Acorus* seems to bear the same relation to Orontials as *Pandanus* and *Freyenectia* to *Cyclanths*. Blume considers these plants to be allied, on the one hand, by *Pothos* to Peppers and *Saururaceæ*, and, on the other, to Lilyworts.—*Rengelm.* 2. 71. in which he is probably right; for *Aspidistrea* form a connecting link between Orontials and Lilies. Brown has remarked that in *Dracontium polyphyllum* and *foetidum*, in which there is no albumen, the plumule consists of imbricated scales, and that it is sometimes double or even triple. In the former of these plants the external scales, in germination, quickly wither away, when other smaller and larger ones appear, and remain for some time round the base of the primary leaf, before the development of which no rootlets are emitted. — *Poech. 733.* A curious economy has been noticed by Du Petit Thouars, in his genus *Onycholepis* at Alameda.

The plants of this Order chiefly occupy woodland stations well in the shade of tall trees, but many are found in colder latitudes; for *Symplocarpus* is common in the swamps of the United States; *Calla palustris* inhabits the deep woods from marshes of S. Lapland, in 61° N., and on the Andes, *Pothos pulchrum* and *galeatum* rise to the height of 8400 feet above the sea.

The fresh leaves of *Monstera pertusa* are employed by the Indians of Denmark as vesicatories or rubefiants in cases of dropsy. The root and seeds of *Scindapsus*, *Symplocarpus foetidus*, a most fetid species, are powerful acrimoniales and expectorants; they have considerable reputation in N. America, as palliatives of paroxysms of asthma. *Dracontium polyphyllum*, said to be the Indian plant of *Arumum*, is reputed to possess similar properties. *Orontium aquaticum* is used when fresh, and the dried root can be eaten without inconvenience. The roots of the beautiful *Richeria africana*, with its snowy spathe and golden spadix, was formerly officinal under the name of *Radix Ari Æthiopii*. The rhizomes of *Calla palustris*, although acrid and caustic in the highest degree, are, according to Linnæus, made into a kind of bread in



FIG. CXXXII.

FIG. CXXXII.—*Calla palustris*. 1. A flower. 2. A section of the ovary. 3. A longitudinal section of the ripe fruit. 4. A seed. 5. Its longitudinal section. — *Walt.*



high estimation, called Missebrød, in Lapland. This is performed by drying and grinding the roots, afterwards boiling and macerating them till they are deprived of their acrimony, when they are baked like other farinaceous substances. The plant has the credit of being a very active diaphoretic. The fruit of *Scindapsus officinalis*, cut into transverse pieces and dried, is an article of some importance in Hindoo Materia Medica, is called Guj-pippul, and sold by the druggists under that name.—*Roxb.* *Pothos scandens* is employed in India as a remedy for putrid fevers. The rhizome of *Acorus Calamus* contains an aromatic bitter principle, which has caused the plant to be regarded as medicinal. In cases of chronic catarrh and humid asthma benefit has been received from its exhibition. In Constantinople it is made into a confection, is considered a good stomachic, and eaten freely during the prevalence of epidemic diseases. It is in this country chiefly employed by perfumers, in the manufacture of hair powder, on account of the fragrance of the essential oil which is mixed with its farinaceous substance. Dr. Pereira says, that although it is rarely employed in medicine, it might frequently be substituted for other more costly aromatics; it is adapted to cases of dyspepsia, or as an adjunct to tonics or purgatives.

## GENERA.

Tribe I.— <i>Callex</i> . Flowers naked. Ovules erect.	Tribe II. — <i>Orontieæ</i> . Flowers with a regular perianth. Leaves plane, entire, palmate or pinnated. Ovules pendulous.	Tribe III. — <i>Acoreæ</i> . Flowers with a regular perianth. Leaves ensiform, equitant. Ovules pendulous.
<i>Calla</i> , Linn.	<i>Anthurium</i> , Schott.	<i>Gymnostachys</i> , R. Br.
<i>Monstera</i> , Adans.	<i>Spathiphyllum</i> , Schott.	<i>Acorus</i> , Linn.
<i>Heteropsis</i> , Kth.	<i>Dracontium</i> , Linn.	
<i>Scindapsus</i> , Schott.	<i>Symplocarpus</i> , Salisb.	
* <i>Rhaphidophora</i> , Hassk.	<i>Ictodes</i> , Bigelow.	
	<i>Spathyema</i> , Rafin.	
	<i>Orontium</i> , Linn.	
	<i>Pothos</i> , Linn.	
	<i>Lasia</i> , Loureir.	

NUMBERS. GEN. 13. Sp. 7C.

*Piperaceæ.*POSITION.—*Juncaceæ*.—ORONTIACEÆ.—*Liliaceæ*,  
*Araceæ*.

## ADDITIONAL GENERA, &amp;c.

*Cyrtosperma*, Griff. near *Lasia*.  
*Rhodospatha*, Pöpp. & Endl.  
*Goniurus*, Presl.

*Hydnostachyon*, Liebm.  
*Schismatoglottis*, Zoll. near *Calla*.

For *Aspidistrea*, which ought perhaps to be placed here, see pp. 202 and 205, and *Kunth. Enum. vol. V.*

*Richardia*, a genus mentioned accidentally in the last page, really belongs to *Arads*.



## ALLIANCE XVI. LILIALES.—THE LILAC ALLIANCE.

DIAGNOSIS.—*Hypogynous, bisexual, homostylous flowers, with copious albumen.*

These are the centre of the division of Endogens with complete flowers free from the ovary. They are known from the Xyrids by their sepals and petals being all equally coloured; from the Juncals by their tender highly developed flowers; and from the Aismals by their abundant albumen. To Palms they often approach in habit, and even in the separation of their sexes; but the genera described by botanists as unisexual or dioecious seem to be never truly dichlamous, the distinct mollments of one sex always accompanying the perfect state of another. By the Gollusnats they seem to show a tendency to assume the glumaceous condition; Pontederals are evidently on the line of Aismals, by their genus *Leptanthus*; Juncals are brought into the closest proximity by the *Aphyllanthus* among Lilies, and so are *Amaryllids* by means of the *Commaticeras* in the same great Order. Their undoubted accordance with Dierpenens, in many essential particulars, enables them to extend their frontier to that of the vast mass of Eudogens; and their wood, which does certainly, in Yucca and Dioscorea, arrange itself in circles, confirms the tendency of the Liliads towards a junction with the same class.

## NATURAL ORDERS OF LILIALES.

<i>Perianth surrounded by a cupular membrane, the lower lobes of which are veined and petaloid . . . . .</i>	} 39. EUPHORBACEÆ.
<i>Perianth naked, flat when unfurrowed. Anthers fused externally; style distinct; albumen fleshy . . . . .</i>	
<i>Perianth naked, flat when unfurrowed. Anthers fused externally; style solid at base. Albumen fleshy . . . . .</i>	} 40. MIMOSACEÆ.
<i>Perianth naked, revolute when unfurrowed. Anthers fused inwards. Albumen woody . . . . .</i>	
<i>Perianth naked, revolute when unfurrowed. Anthers fused inwards. Albumen woody . . . . .</i>	} 41. LYTHRACEÆ.
<i>Perianth naked, revolute when unfurrowed. Anthers fused inwards. Albumen woody . . . . .</i>	



## ORDER LX. GILLIESIACEÆ.—GILLIESIADS.

Gilliesiæ, *Lindl. in Bot. Reg.* 992. (1826); *Hooker in Bot. Mag.* 2716. (1827).—Gilliesiaceæ, *Ed. pr.* cxlix. *Endl. Gen.* p. 152; *Meisner, Gen.* p. 398.

DIAGNOSIS.—*Lilial Endogens with a calyx-like involucre, the inner bracts of which are coloured and petal-like.*

Small herbaceous plants, with tunicated bulbs. Leaves grasslike. Flowers umbellate, somewhat spathaceous, inconspicuous, hermaphrodite, surrounded by bracts the outer of which are petaloid and herbaceous, the inner starved and coloured. Perianth minute, either a single lip-like lobe, or an urceolate 6-toothed body. Stamens 6, either all fertile, or 3 sterile and nearly obliterated. Ovary superior, 3-celled; style 1; stigma simple. Capsule 3-celled, 3-valved, with a locuicidal dehiscence, many-seeded. Seeds attached to the axis, by means of a broad hollow neck; testa black and brittle; embryo curved in the midst of fleshy albumen.

To the following account of these plants, originally given in the *Botanical Register*, when speaking of *Gilliesia*, little has to be added.

"The whole structure of this plant is so peculiar, that I scarcely know whether the description of the parts of fructification above given will not be considered more paradoxical than just; and yet, if the analogies the various organs bear to those of other plants be carefully considered, their structure will scarcely admit of any other interpretation. With respect to the five petaloid leaves, which are here described as bracts, and which bear a considerable degree of resemblance to a perianth, it may be observed, that this appearance is more apparent than real; they neither correspond in insertion nor in number with the segments of a monocotyledonous perianth, nor do they bear the same relation to the parts contained as a perianth should bear. The three outer are not inserted on the same line, but are distinctly imbricated at the base; and the two inner do not complete the second series, as would be required in a regular monocotyledonous perianth. But if we were to admit, for a moment, the possibility of these bracts being segments of a perianth, what explanation could be given of the setiform processes proceeding from their base, or of the central fleshy slipperlike body from within which the stamens proceed? The former bear no determinate relation to the other parts of the flower in their insertion; they are subject to much diversity of form and number, being sometimes eight, consisting of two unequal subulate bodies proceeding from the edges of each lateral segment, the outermost of the two being wider than the innermost, and being, moreover, not unfrequently a manifest process of the margin of the segment itself; sometimes having their number reduced to four by the suppression of the exterior processes of each lateral segment; and occasionally having the outer processes suppressed on one segment, and not suppressed on the other. In the many flowers which have been under examination, the processes, moreover, were always constituted of cellular tissue alone, without either spiral or tubular vessels. These circumstances being considered, it will scarcely be proposed, we presume, to identify them with abortive stamina. If they are, notwithstanding what has been advanced, determined to be the perianth itself, what

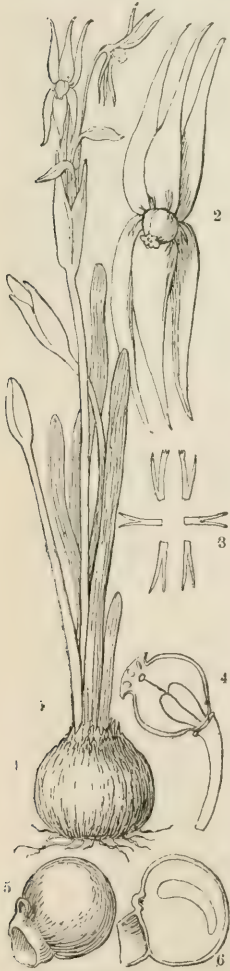


Fig. CXXXIII.

Fig. CXXXIII.—1. *Miersia chilensis*; 2. its flower; 3. the interior coloured petaloid bracts; 4. a perpendicular section of the perianth (from a sketch by Mr. Miers); 5. a seed of *Gilliesia graminea*; 6. a section of the same.



becomes of the outer segments, which had previously been referred to the perianth, but it would be difficult to trace any analogy between the structure of *Gilliesia* and of those genera in which a third series is added to the usual ternary. The case of *Miersia* is similar, but none of the peculiarities adverted to are opposed to those bracts being referred to depauperated or reduced bracts. With respect to the central body, one which the stamens precede, this body, which might be conveniently disposed of by referring it to what Linnaean botanists call a nectarium, consists of a fleshy stipitate base, with or without two auricles at the base, and within which the cup of stamens is inserted. The relation it bears, as regards insertion, to the parts which have been already noticed, is very obscure; it is always opposite the solitary external bracts; but whether it rises with respect to the common axis of androecium, or perianth, has not at present been ascertained. The reasons which have been offered for the view here taken of the parts surrounding this body, make it obvious that it must be considered the perianth. It manifestly bears an intimate relation to the stamens, being adnate to the same direction and degree as they are. In this view, then, the pointed segments are considered perfect bracts, the subulate interior processes abortive bracts, and the fleshy central labelloid body the perianth. However paradoxical this description of the parts may appear, it will probably be found more deserving of attention if compared with *Miersia*. In *Miersia* the bracts are six in number, of which two are internal and four exterior, a still more valid reason against their being segments of a perianth. The subulate processes assume a more regular form, and a more constant mode of insertion, they still bear no very apparent relation to the bracts, and the fleshy labelloid body is represented by an urceolate six-toothed cup, within the orifice of which six fertile stamens are included. In *Miersia*, therefore, the perianth, which was in *Gilliesia* subject to a certain degree of imperfection, in which the stamens also participated, is in the usual regular form of many Monocotyledons, no irregularity occurring in the stamens. As there can be no doubt of the affinity between *Gilliesia* and *Miersia*, and as there can also be little doubt that the central body of the latter genus is a perianth, it will follow, that as the supernumerary appendages of that genus are external with respect to the perianth, and are therefore neither perianth nor stamens, so also will the analogous appendages of *Gilliesia* not be perianth. And the central body having been ascertained to be perianth, all the parts which surround it will necessarily be bracts, or reduced bracts of them.

"The natural affinity of these two genera is obscure. Their black, brittle, somewhat large axile embryo, tunicated bulb, spathaceous inflorescence, and general appearance place them near Lilyworts, with some genera of which, especially *Maesa* and *Purpurea*. *Maesa* at least agrees in the structure of perianth; but there is no genus among the Lilies to which the fructification of *Gilliesia* can be otherwise compared. If the one-flowered species of *Schoenus*, in which a single naked flower is surrounded by several imbricated scales, be admitted as a form of inflorescence analogous to that under consideration, it may perhaps be allowable to carry this comparison yet further, and to suggest an identity of origin and function between the depauperated bracts of *Gilliesia* and the hypogynous setae of *Scirpus* and other Sedges."

But although such plants may be analogous in structure to the *Coriandras*, as well as to *Coriandis*, to which they were also compared in the work above quoted, yet it is hardly to be expected that they can exist, that they form a most curious part of the Lillal Alliance.

Chilcan bulbs, of no known size.

## GENERAL

Gilhesa, Lindl.

[illegible]

NUMBERS, GEN. 2, Sp. 5.

POSITION. ——— GULLIVERTOWN.—Lilac  
C. <sup>1</sup> <sub>2</sub> <sub>3</sub> <sub>4</sub> <sub>5</sub> <sub>6</sub> <sub>7</sub> <sub>8</sub> <sub>9</sub> <sub>10</sub> <sub>11</sub> <sub>12</sub> <sub>13</sub> <sub>14</sub> <sub>15</sub> <sub>16</sub> <sub>17</sub> <sub>18</sub> <sub>19</sub> <sub>20</sub> <sub>21</sub> <sub>22</sub> <sub>23</sub> <sub>24</sub> <sub>25</sub> <sub>26</sub> <sub>27</sub> <sub>28</sub> <sub>29</sub> <sub>30</sub> <sub>31</sub> <sub>32</sub> <sub>33</sub> <sub>34</sub> <sub>35</sub> <sub>36</sub> <sub>37</sub> <sub>38</sub> <sub>39</sub> <sub>40</sub> <sub>41</sub> <sub>42</sub> <sub>43</sub> <sub>44</sub> <sub>45</sub> <sub>46</sub> <sub>47</sub> <sub>48</sub> <sub>49</sub> <sub>50</sub> <sub>51</sub> <sub>52</sub> <sub>53</sub> <sub>54</sub> <sub>55</sub> <sub>56</sub> <sub>57</sub> <sub>58</sub> <sub>59</sub> <sub>60</sub> <sub>61</sub> <sub>62</sub> <sub>63</sub> <sub>64</sub> <sub>65</sub> <sub>66</sub> <sub>67</sub> <sub>68</sub> <sub>69</sub> <sub>70</sub> <sub>71</sub> 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Chlorine



## ORDER LXI. MELANTHACEÆ.—MELANTHS.

Melanthææ, *Batsch, Tab. Aff.* (1802).—Colchicææ, *Dec. Fl. Fr.* 3. 192. (1815); *Ess. M éd.* 298. (1816); *Barth. Ord. Nat.* 51. (1830).—Melanthaceæ, *R. Brown, Prodr.* 272. (1810); *Endl. Gen.* liii. *Meisner, Gen. p.* 404. *Kunth, Enum.* 4. 136. *A. Gray, Lyceum, N. York, vol. 4.* (1837).—Veratrææ, *Salisb. in Hort. Trans.* 1. 328. (1812); *Agardh Aphor.* 166. (1823).—Merenderæ, *Mirb. according to De Candolle*.—Anguillareæ, *Don, in Linn. Trans.* 18. 513.

DIAGNOSIS.—*Lilial Endogens with a naked perianth, flat when withering, anthers turned outwards, distinct styles, and fleshy albumen.*

Bulbous, tuberous, or fibrous-rooted plants, extremely variable in appearance; in the Colchicææ stemless, with the flowers half subterranean like a Crocus; in the Veratrææ, with spiked, racemose, paniced, branching, or simple herbaceous stems. Flowers not

unfrequently ♂ ♀, white, green, or purple. Calyx and corolla both alike, free, petaloid, in 6 pieces, or, in consequence of the cohesion of the claws, tubular; the pieces generally involute in æstivation. Stamens 6; anthers turned outwards. Ovary 3-celled, many-seeded; style 3-parted; stigmas undivided; [ovules orthotropal, semi-campylotropal, semi-anatropal or anatropal, *Endl.*] Capsule generally divisible into 3 pieces; sometimes with a loculicidal dehiscence. Seeds with a membranous testa; albumen dense, fleshy or cartilaginous; embryo very minute, inclosed, extremely uncertain in its position.

The plants of this Order have in some cases the appearance of Crocuses, in others that of small Lilies. Brown considers its station to be between Lilyworts and Rushes, from both which it is known by its tripartite fruit, and anthers turned outwards. The latter character gives the Melanth

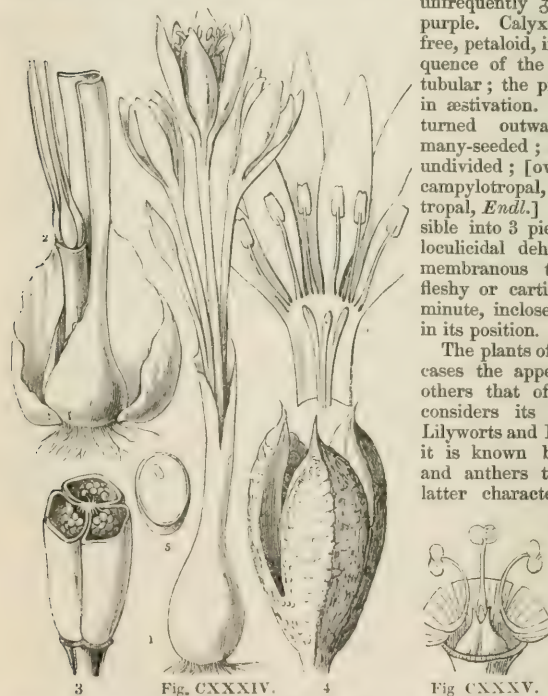
their distinctive character, more than anything else, and, combined with their separable carpels, generally renders their identification free from difficulty. Don has well observed that "the genus Colchicum establishes an evident relationship, through *Sternbergia* and *Crocus*, between Melanth, *Amarylids*, and *Irids*; *Disporum* joins them to *Smilacææ*, and *Tofieldia* to *Rushes*, while a comparison of the structure of *Uvularia* and *Erythronium* fully makes out their affinity with *Liliacææ*."

Frequent at the Cape of Good Hope, not uncommon in Europe, Asia, and North America, and existing within the tropics of India and New Holland, this Order appears to be confined within no geographical limits; it is, however, far more abundant in northern countries than elsewhere.

Few Orders of plants are more universally poisonous than this, whose qualities are conspicuously indicated by *Colchicum* and *Veratrum*. The corm and seeds of the

Fig. CXXXIV.—*Colchicum autumnale*. 1. A corm in flower; 2. The same stripped of its outer coats, and showing the ovaries after the floral envelopes are cut away; 3. a transverse section of the ovaries; 4. a ripe capsule; 5. a section of a seed; 6. the flower cut open, to show the stamens and the 3-parted style.

Fig. CXXXV.—Section of the centre of the flower of *Veratrum nigrum*.





former are well-known to be acrid, cathartic, emetic, and diuretic. The latter are powerful dangerous emetic. These properties are owing to a peculiar albumen which is met with in *Veratrum*, which acts with singular energy on the secretions of the bowels, exciting violent stooping, though taken in very minute quantity. When received internally in very small doses, it produces excessive irritation of the mucous coat of the alimentary canal, and a few grains are found fatal to the lower animals. *Veratrum viride* of North America is an acrid, emetic, and powerful diuretic, followed by severe effects. Numerous accidents have followed the incautious use of Mexican Saffron, *Colchicum autumnale*; it is only a few months since a woman was poisoned by the squills of *Colchicum* roots, which had been thrown away in Covent Garden market, and which she mistook for onions. White Hellebore, *Veratrum album*, the leaves of the *Veratrum* sacred by gardeners to destroy the Gooseberry Caterpillar, and similar to those of *Veratrum officinale*, an Alpine Mexican plant, yields most of the *Colledilla*, *C. bellidifolia*, *Colledilla* seeds of cammiree, which were formerly used to destroy polenta, and as cathartics, and have also been employed in chronic rheumatism and gonorrhoea, and in neuralgic cases, but are now chiefly consumed in the decoction of *Veratrum*, *Veratrum frigidum*, called in Mexico *Savon*, is used to treat a few well known diseases, supplanting the horses that feed upon it. The root of *Helleborus* is used in infusions, as anthelmintic, but its tincture is bitter and tonic; when chewed it excites the stomach and produces vomiting; the N. Americans call it Blazing Squaw Root &c. A decoction of *Helonias bullata* is given in obstructions of the bowels. *Amianthium muscivomum* is said to poison cattle which feed upon its foliage in the autumn, whence the United States Americans call it Fall Poison; they employ it to destroy flies. *Cynodorus* are said to be simply astringent; the bruised leaves of *Cynodorus* *grandifolius* are a popular remedy in the United States for the bite of the rattlesnake. The *Hermione* is of the Andeans, formerly so celebrated for soothing pains in the joints, were some of the *Colchicum variegatum*, a species found in the Mediterranean. Dr. Ruge found them in the bazaars of India, where they bear names traceable to the *Asclepias* and *Opuntia* of the Greeks.

GENERA.

[illegible]

NUMBERS, GEN. 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877,

Posados, ————— *Indigenas*  
Moxos, ————— *Indigenas*  
Amanes, ————— *Indigenas*

### ADDITIONAL NOTES

Isabelle T. Hwang, *Ph.D.*, is an assistant professor of psychology at the University of Illinois at Chicago.



## ORDER LXII. LILIACEÆ.—LILYWORTS.

*Lilia*, Juss. Gen. 48. (1789).—*Narcissi*, the first sect. *Ibid.* 54. (1789).—*Hemerocallideæ*, R. Brown Prodr. 295. (1810).—*Liliaceæ*, DC. Théor. Elém. 1. 249. (1813); Endl. Gen. lv.; Meisner, p. 398; Kunth, Enum. 4. 215; Ann. sc. 2. ser. 18. 290.—*Tulipaceæ*, DC. Ess. Méd. 297. (1816); Bernh. in Botan. Zeit. Oct. 1835.—*Coronariæ*, Agardh Aphor. 165. (1823).—*Asparagi* and *Asphodeli*, Juss. (1789).—*Asphodeleæ*, R. Brown Prodr. 275. (1810); Kunth, Enum. 4. 280.—*Alliaceæ*, *Aloinæ*, *Hyacinthinæ*, *Dracænaceæ*, Link Handb. vol. 1. (1829).—*Asparaginæ*, Ib.—*Asparageæ*, DC. and Duby, 458. (1828).—*Asparagineæ*, Ach. Rich. Dict. Class 2. 20. (1822); Nouv. Elém. ed. 4. 430. (1828).—*Convallariaceæ*, Link Handb. 184. (1829.)

DIAGNOSIS.—*Lilial Endogens* with a naked perianth, flat when withering, anthers turned inwards, consolidated styles, and fleshy albumen.

Herbaceous plants, shrubs or trees, with bulbs, or tubers, or rhizomes, or fibrous roots. Leaves narrow, with parallel veins, only in a very small number expanded into a broad blade with diverging veins; never articulated with the stem. Flowers large and showy, or small and green, with all kinds of intermediate gradations; in nearly all cases ♂; never, perhaps, truly ♂ ♀. Calyx and corolla confounded, coloured alike, regular or nearly so, occasionally cohering in a tube. Stamens 6, inserted into the sepals and petals. Anthers opening inwards. Ovary free, 3-celled, many-seeded; style 1; stigma simple, or 3-lobed; ovules anatropal or amphitropal. Fruit succulent, or dry and capsular, 3-celled. Seeds packed one upon another in 1 or 2 rows; embryo with the same direction as the seed, in the axis of fleshy albumen, or uncertain in direction and position, occasionally very minute.

The beautiful creations which constitute the Order of Lilies would seem to be well known to all the world; for what have been so long admired and universally cultivated as they? Nevertheless, there are few great groups of plants which have been more neglected by the exact botanist, or which stand more in need of his patient attention. The best proof of the justice of this assertion is to be found in the unsteady and conflicting views of botanists as to its limits, or the subordinate groups Fig. CXXXVI. which it contains. While

one writer breaks Lilyworts up into a number of distinct Orders, another refuses to recognise the limits assigned to them by his predecessor, and prefers a new arrangement, just as unsatisfactory as that which it succeeds. We have seen the classification of Jussieu and Brown break down beneath a rigorous scrutiny; it has been succeeded by schemes of Bartling, Endlicher, Kunth, Meisner, Bernhardi and others, all alike unsatisfactory; and I doubt whether we can be truly said to know more about the true characteristics and exact structure of a very large proportion of this Order, than we did twenty years ago. Genera in plenty have been added, but a good combination of



Fig. CXXXVII.

Fig. CXXXVI.—1. Section of seed of *Asphodelus ramosus*; 2. of *Tulipa hortensis*.

Fig. CXXXVII.—*Arthropodium paniculatum*. 1. A flower magnified; 2. a ripe capsule; 3. a transverse section of it; 4. a vertical section of a seed.



them is still wanted. Under these circumstances it seems to me better not to hasten, with the supposed Orders or Suborders that have of late years been proposed, but to gather together, in tolerably natural groups, under the Order of Liliæ, everything that does not belong to the other parts of the Liliat Almoires. It will be a task sometimes for some botanist, with ample materials and good general views, to study the details of the structure of these interesting plants, and out of those details to form an harmonious and solid classification. In the meanwhile, a few general remarks upon such groups as are here adopted are all that it will be useful to bring forward.

The favourite distinctions among the majority of systematic botanists are those by which the Liliaceæ, Asphodeleæ, and Asparagææ or Smilicææ of authors are said to be known. Brown thought to distinguish them by their seeds and fruit, according to the first a spongy and dilated or winged seedcoat and a capsule, rarely a berry; to the second, a black brittle seedcoat; and, to the third, a membranous seedcoat and berry. With regard to the colour of the seedcoat or its texture, I must remark first, that one would be slow to recognise such a peculiarity as a valid distinction, even if general, and that as an ordinal characteristic, it is still less admissible; that exceptions to such a character appear, as might be expected, in all directions, and prove it to be utterly illusory. By the great botanist just mentioned, the distinction of Smilicææ was strengthened by adding to its character an embryo remote from the hilum, and it is probable that this circumstance deserves more attention than it has hitherto possessed. *Streptopus*, then, which is expressly named by Brown as one of his Smilicææ, has the embryo next the hilum; so that this character also is untenable. Barthling, who retains Smilicææ, adds to the distinction of the Order a minute embryo, but then he admits such genera as *Asparagus* and *Drymophila*, in which the embryo is the same as that of Asphodeleæ. Bernhardt assigns to his Tulipaceæ anthers attached to the filament by a fine point lodged in a narrow canal, and an inflorescence without probranous spathes; or, as Jussieu expressed it, *Flores nudi*, while he gives Asphodeleæ anthers attached to the filament by a broad base, and membranous bracts, containing moreover under the name of Alliaceæ, the Asphodeleæ, Hypoxis, *Alisoæ*, Amaryllids and others, a proposition in which I think no judicious botanist would concur. But the character derived from the anther of Tulipaceæ, if valid, surely Kunth denies, is trifling; and as to the peculiarities asserted to exist in the inflorescence of these plants, such membranous bracts do not exist in *Eucallis* among Asphodeleæ more than in *Fritillaria persica* among Tulipaceæ, while the *Gageæ* have all the habit of the former group, and if it were otherwise it would be idle to propose such a character for the mark of a natural Order. M. Adrien de Jussieu has lately reduced these Orders to two, viz. Liliaceæ and Smilicææ, giving the former an undivided style and parallel veined leaves, while the latter have a triple style and branched leaves. In this respect he appears to adopt the views which are taken in the present work. That good and high grounds of distinction will one day be found for some at least of the groups here admitted is probable; but they have not yet been discovered, nor is it likely that they will be until the true nature of the ovules, the position of their foramen, the direction of the embryo, and similar circumstances shall have been inquired into with scrupulous accuracy. In the meanwhile the following may be taken as the chief peculiarities of the sections now admitted.

TULIPÆÆ are the Lilia of Jussieu, a couple of his genera being excluded, and they may be justly regarded as the type of the Order of Liliæ. Bulbs, round more or not at all branched, flowers usually large and gaily coloured, without membranous spathes, but axillary to leaves but little changed, the calyx and corolla and their parts scarcely united, although often arranged in a tube, anthers swinging freely by the fine drawn point of a stiff filament, and finally a dry seed vessel, separate the group from all that follow. They are among the gayest of our garden flowers, as Tulips, Fritillaries, and Dogs' Tooth Violets testify; one of them indeed, the *Lilium chalcidicum*, a plant that covers the plains of Syria with its scarlet flowers, is most remarkable from having been selected by our Saviour as the subject of allusion in the Sermon on the Mount. The *Gloriosa*, a tuberous plant from India, hardly belongs to them.

THE HEMEROCALLEÆ or DAY LILIES, differ from the last in nothing except their calyx and corolla being so joined to each other as to form a tube of temporary growth, and in their want of a bulb in many instances. The Asperithææ, so commonly cultivated in vases for decorating architectural gardens, and the fragrant Tuberous, are the more remarkable among them; but *Funkia*, *Hemerocallis*, *Isotria*, and the *Syrin-*  
*gias* and *Tritomas*, are also species of familiar occurrence. *Thalictrum*, which joins the celebrated flax of N. Zealand, with its hard perennial leaves and perennial green flowers, must be considered to connect the present division with that of C. Almoires.

There is so little to separate *Alonsoa*, or *Aloes*, from the Day Lilies, that scarcely anything can be named except their succulent foliage: and even that disappears in



*Yucca*, which has the hard leaves of *Phormium*, with which however its distinct sepals and petals forbid its being associated.

With the *SCILLEÆ* or *SQUILLS*, we reach a division of the Order, abounding in beautiful species, all of which are bulbous, with annual stems. Their peculiarity resides in the anthers not being so lightly attached to the filaments as in *Tulipeæ*, and in the leaves from whose axils the flowers proceed, acquiring a membranous condition.

*CONANTHEREÆ* are Squills with the ovary partially adhering to the calyx and corolla, and springing from tubers, not bulbs. They offer a direct transition to *Amaryllids*.

*ANTHERICEÆ* or *ASPHODELS*, agree with the last in having tubers or fleshy fascicled roots and not bulbs, but their ovary is free; they are therefore tuberous or fibrous rooted Squills. *Chrysobactron*, a genus gathered by Dr. Joseph Hooker, in Auckland and Campbell's islands, is described as dicecious, but apparently is polygamous. The fruit in these three last Orders is a capsule.

*APHYLLANTHÆ* are plants with the habit of Rushes, and the bracts so membranous and closely imbricated, as to give the appearance of *Xyrids* when the flowers are past. They seem to form a connection between Lilies and some plants of the Juncal or *Xyridal* Alliances. The genera have been very insufficiently examined. *Xanthorrhæas*, called Grass Trees in New Holland, are very different in habit from the remainder; their shrubby stems, which emulate small Palm trees in appearance, bear tufts of long wiry foliage at their extremities, from the midst of which rise very long cylindrical spikes of densely compacted flowers, resembling Bullrushes (*Typha*). By this genus the *Aphyllanth*s completely join Rushes, for the genus *Kingia*, included in Rushes, because of its minute embryo, has entirely the aspect of a *Xanthorrhæa*.

The reason for referring *WACHENDORFÆ* hither, have been given in speaking of the Bloodroots (p. 152). They are plants with ensiform or plaited leaves of a hard texture, fibrous roots, with flowers usually in panicles and by no means remarkable for size or bright colouring. If it is really true that their carpels are opposite the petals, as is said, they will undoubtedly have to be removed from their present station.

*ASPARAGÆÆ* are Lilies with a succulent fruit. They consist of plants extremely dissimilar in appearance, the common Asparagus and the Lily of the Valley being associated under this title. In general their leaves are broad; in the genus *Cordylina* they even acquire the expanded form and diverging veins of the Amomal Alliance. Their stems, although among the dwarfest that the Lilies comprehend, are in the common Asparagus branched and of considerable size, and in the Dragon-trees they acquire the dimensions and age of large trees. A tendency to the separation of sexes occurs here on the part of the genus *Ruscus*; but it is not carried so far as to constitute a diclinous structure. According to Von Martius (*Choix*, p. 21.), the position of the sepals in Lilyworts (in which he includes *Asphodeleæ*) is  $\nabla$  with respect to the axis; while in *Asparagææ* it is  $\triangle$ . He also finds throughout the Liliaceous Order that the petaline stamens are larger and more perfect than the sepaline, it being the latter moreover which disappear when there is any deficiency in the usual number of stamens.

With respect to *ASPIDISTRÆÆ*, concerning whose structure we have very insufficient information, they are principally known by a large mushroom-shaped stigma. Their foliage is that of Gingerworts; their flowers are dingy purple or green, with a campanulate perianth, on whose sides the stamens are inserted. In many respects they are very like *Orontiads*, to which, perhaps, they ought to be referred.

In like manner the *OPHIPOGONÆÆ*, or *TEATWORTS*, have a foliage hardly belonging to Lilies, *Peliosanthes* Teta resembling a Ginger more than a plant of this Order. They are remarkable for their seeds bursting through the sides of the ovary at a very early period, growing freely though exposed to air, and finally acquiring the succulent appearance of a tuber. It is very uncertain whether they have any real claim to the rank of Lilies.

If we suppose that the doubtful members of this great Order are removed, we shall find that its most immediate relations are as follows. From the *Melanths* it chiefly differs in its anthers being turned inwards, and its carpels quite consolidated. To the *Amaryllids* it approaches so nearly that there is perhaps nothing to separate them except its free ovary; and the group *Conantherææ* exhibits a structure intermediate in this respect. With Rushes Lilyworts are brought into close contact by means of the *Aphyllanth*s as has been already stated. Towards *Arads* they extend in the direction of *Orontiads*, through the intermediate group of *Aspidistrææ*. Finally, it is here that *Dictyogens* are reached by means of the *Asparagææ*, which, by most botanists, are actually made to comprehend the genus *Smilax* and the *Parids*. For the affinity of Lilies and Palms, the reader is referred to the observations under the latter Order.

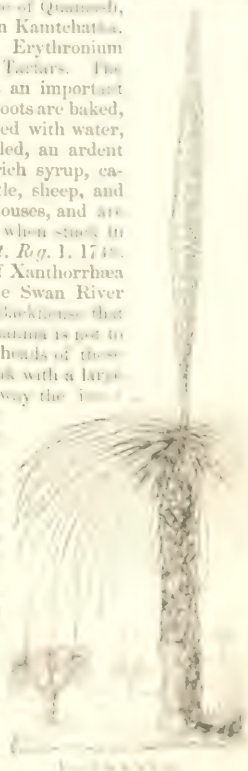
The geographical limits of the Order are as wide as its differences of structure. Upon the whole, however, the species are much more abundant in temperate climates than in the tropics, where they chiefly exist in an arborescent state. *Aloes* are mostly found



in the southern parts of Africa; one species is a native of the West Indies, and two or three more of Arabia and the East. Dracæna, the most plentiful of the Order, attains their largest size in the Canaries; a D. Drupæ there is described as being 100 years old and 75 feet high, 46½ feet in circumference at the base, and was known to have been a very ancient tree in the year 1498. The northern Flora is remarkable for the great part plants of the genera *Scilla*, *Hyacinthus*, *Allium*, and *Ornithogalum*. In the East Indies Lilyworts are rare; in New Holland they form a distinctly marked botanical vegetation, and in New Zealand they are represented by the *Phormium* or *Flax-tree*.

A very considerable number are employed for the purposes of husbandry. Among the most extensively useful are those whose fibre is strong enough to furnish ropeage. Such are *Phormium tenax*, the New Zealand Flax, whose toughness exceeds that of Hemp, and the *Sansevieras*, a race of hard-leaved perennial plants, found all over the tropics of Africa and India, from which a yet stronger substance is obtained under the name of African Hemp, or Bowstring Hemp. The *Yuccas* too yield a numerous fibre, but it is of comparative unimportance. Several species have been used as food from the most remote antiquity; those chiefly belong to *Allium*. The Onion, Garlic, and Leek, says Dr. Royle, called in Arabic *Basil*, *Son*, and *Korras*, seem to be attested in the earliest parts of the Bible (Numbers, ch. xi. v. 19), as the names there used are very similar to these. All are cultivated in gardens in India, as well as *Allium esculentum* and *A. tuberosum*. The bulbs of *Allium leptophyllum* are eaten by the full people, and the leaves are dried and preserved as a condiment. Chives, Shallots, &c. *Rocamboles* are other species of the Alliaceous race. The bulbs of *Camasus oleracea* are eaten by the North American Indians under the name of Quamash, and those of *Lilium pomponium* are roasted and eaten in Kamtchatka, where it is as commonly cultivated as the Potato with us. *Erythronium dens canis* is said to furnish a part of the diet of the Tartars. The *Cordylone Ti* (*Dracæna terminalis*), or *Ti plant*, affords an important part of the food of a Sandwich islander. Its great woody roots are baked, when they become sweet and nutritious. Bruised, mixed with water, and fermented, it forms an intoxicating beverage; distilled, an ardent spirit is readily obtained; boiled before fermentation, a rich syrup, capable of being a substitute for sugar, is the result. Cattle, sheep, and goats are fond of the leaves, which furnish thatch for houses, and are woven into a kind of cloth. Its trunks take root when stuck in the ground, and form a valuable permanent hedge.—*Bot. Reg.* 1. 1747. Mr. Drummond says that the tops of different species of *Xanthorrhæa* furnish all kinds of cattle with valuable fodder, in the Swan River colony. *Hedley Journ.* 2. 323; and we learn from Mr. Backhouse that the base of the inner leaves of the Grass tree of Tasmania is not to be despised by the hungry. The aborigines beat off the heads of these singular plants by striking them about the top of the trunk with a large stick; they then strip off the outer leaves and cut away the inner ones, leaving about an inch and a half of the white tender portion, joining the trunk: this portion they eat raw or roasted; and it is far from disagreeable in flavour, having a milky taste, slightly balsamic. There are some other species of Grass-tree in the colony, the base of the leaves of which may also be used as food: those of the dwarf Grass-tree, *Xanthorrhæa humilis*, which is abundant about York Town, may be obtained by twisting the inner leaves firmly together, and pulling them forcibly upwards; but care is required not to cut the fingers, by slipping the hand. Even in Europe the young shoots of *Polygonatum* (Solomon's Seal), and others, have been substituted for Asparagus, and the annual cultivation of the latter for kitchen purposes is known to every one.

*Aloes* and *Squills* indicate the value of some Lilies in medicine. The acrid matter which thus renders them valuable as purgatives or emetics, is found in a considerable number of species. The bulb of the *Lupulus* or *Scilla maritima*, and *Pancratium*, (the *ΣΚΙΛΛΗ* and *ΠΑΝΚΡΑΤΙΟΝ* of Dioscorides) is nauseous and acrid, acting either as an emetic, purgative, expectorant, or diuretic, in proportion to the dose. In what it is given, its properties are said to be due to a peculiar principle, called by Vogel, *Squillum*. It is purgative





that in India a species very closely allied to the Mediterranean plant, and called *Scilla indica* by Dr. Roxburgh, is substituted for the *Urginea maritima*, and Iskeel given as its Greek name; the bulb is also used by weavers in preparing their thread.—*Royle*. According to Theodore Martius the bulbs of *Ledebouria hyacinthoides* are also used as a substitute for Squills in the East Indies; Ainslie states that they are employed in cases of strangury and fever in horses. Both leaves and roots of *Erythronium americanum* are emetic; so are the bulbs of *Muscari moschatum*, various *Gageas*, *Hyacinths*, and *Ornithogalums*. As purgatives, the Aloes are in most extensive use; it is, however, exclusively from the arborescent species, especially *A. vulgaris*, *soccotrina*, *purpurascens*, and *spicata*, that the drug is collected. Similar qualities reside in *Bulbine planifolia*, the roots of common *Asparagus*, Lily of the Valley, the capsules of *Yuccas*, &c. As may be supposed, the peculiar secretions which produce actions like these will, when a little modified, become diuretic; and thus we have a long list of species to which this quality is attributed. Foremost are *Alliums*, whose bulbs abound in free phosphoric acid; then follows *Asparagus*, notorious for its singular effect upon the urine, many of the emetic species, and the roots of *Asphodelus ramosus*, *Asphodeline lutea*, *Anthericum ramosum*, the berries of *Smilacina racemosa*, &c. According to Dr. Dieffenbach, the root of *Phormium tenax* is an excellent substitute for Sarsaparilla, acting as a purgative, diuretic, sudorific, and expectorant.—*Chem. Gaz.* 1842. 150. Then, when these acrid principles become concentrated, we have virulent poisons. Such are *Gloriosa superba*, and the fetid bulb of the Crown Imperial, whose very honey is said to be emetic as it distils from the flowers.

Resinous matters are yielded in abundance by some species, whence they have been found useful in dysenteries. Of these the most celebrated is Dragon's-blood, a tonic astringent resin, sometimes employed in diarrhoea and passive hæmorrhages; it is yielded in part by *Dracæna Draco*, from the surface of the leaves, and from the cracks in its trunk; this is, however, scarcely known to modern druggists, who sell the astringent resin of *Pterocarpus*. A fragrant brownish yellow resin, called Botany Bay gum, when burnt smelling like Benzoin, flows in abundance from *Xanthorrhæa arborea*. It is probable that some such secretion occurs in *Dianella odorata*, whose powdered roots are said by Blume to be made into fragrant pastiles. The roots of *Dracæna terminalis* and *ferrea* are said to be useful astringents, to which may be added *Streptopus amplexifolius* and *Ruscus hypoglossum*, both of which have been employed in gargles.

A few miscellaneous instances of useful Liliaceous plants still remain to be added. The roots of *Asparagus racemosus* and *adscendens* are both employed medicinally in North India; those of the latter, conical in form and semi-transparent, are considered a good substitute for salep.—*Royle*. *Polianthes tuberosa*, or the Tuberose, is well known for its delicious fragrance. This plant emits its scent most strongly after sunset, and has been observed in a sultry evening, after thunder, when the atmosphere was highly charged with electric fluid, to dart small sparks, or scintillations of lucid flame, in great abundance from such of its flowers as were fading. The roots of *Sansevieria* have been employed as remedies for gonorrhœa, pains of the joints, and coughs. The bulbs of *Erythronium Dens canis* have been regarded as aphrodisiac and anthelmintic. Oil of Lilies was prepared by infusing the flowers of *Lilium candidum* in oil. *Tulbaghia*, a Cape genus, smelling like Garlic, is boiled in milk and prescribed in phthisical complaints. *Asparagus* owes its remarkable qualities to the presence of a peculiar principle called Asparagin, which is said to be more abundant in *Asparagus acutifolius* than in the species commonly cultivated. The flowers of *Cordylina reflexa* are said to be emmenagogue. A decoction of the root of *Dianella odorata* is administered in Java in gonorrhœa, dysury, and fluor albus, according to Blume. The Butchers' Brooms (*Ruscus*) of Europe, were once celebrated as aperients and diuretics, on account of their bitter, subacid, mucilaginous roots, especially *Ruscus aculeatus*, the *ὄξυμυρσίνη* of Dioscorides. The Arabian writers called the fruit Rhababath, out of which, according to Endlicher, the Latinobarbarous word Cubeba has been corrupted. *Ruscus hypophyllum* had considerable reputation as a stimulant of the uterus. The seeds of these *Rusci* are very horny, and when roasted are said to furnish a pleasant substitute for coffee. The bulbs of the common Tulip are sometimes substituted fraudulently for Colchicums; large quantities have been thus imported from Naples; they are readily known by being true bulbs, while the Colchicum has a corm. It is not a little remarkable that the *Yuccas*, like some species of *Poureroia*, have the property of producing tubers although they have arborescent stems.

#### GENERA.

I.—TULIPEÆ, DC.	<i>Gagea</i> , <i>Salisb.</i>	<i>Hornungia</i> , <i>Bernh.</i>	<i>Cyclobothra</i> , <i>Don.</i>
<i>Erythronium</i> , <i>Linn.</i>	<i>Ornithoxanthum</i> , <i>Lk.</i>	<i>Lloydia</i> , <i>Salisb.</i>	<i>Eucrenum</i> , <i>Nutt.</i>
<i>Dens Canis</i> , <i>Tournef.</i>	<i>Bulbillaria</i> , <i>Zucc.</i>	<i>Rhabdocrinum</i> , <i>Rehb.</i>	<i>Fritillaria</i> , <i>Linn.</i>
<i>Tulipa</i> , <i>Tournef.</i>	<i>Iphigenia</i> , <i>Kth.</i>	<i>Nectarothrium</i> , <i>Led.</i>	<i>Petitium</i> , <i>Linn.</i>
<i>Orithya</i> , <i>Don.</i>	<i>Plecostigma</i> , <i>Traut.</i>	<i>Calochortus</i> , <i>Pursh.</i>	<i>Imperialis</i> , <i>Juss.</i>



[illegible]

## NUMBER OF SPECIES PER SITE

POSITION.—Orontineae—*Hesperomys*  
LATAKE, Mammals  
*Jacksonia*.

## ADDITIONAL NOTES

Romescia, K <sup>12</sup>	} near Sauratira	Chrysobothris, <i>Emm.</i> (near) <i>Prunus</i>
<i>Scutellaria</i> , Robt.		Chrysobothris, <i>Emm.</i> (near) <i>Prunus</i>
Drimysopsis, <i>Emm.</i> near <i>Delphin</i>		Chrysobothris, <i>Emm.</i> (near) <i>Prunus</i>
Chrysobothris, <i>Emm.</i> near <i>Prunus</i>		Chrysobothris, <i>Emm.</i> (near) <i>Prunus</i>
Clara, K <sup>12</sup> near <i>Hernandia</i>		Chrysobothris, <i>Emm.</i> (near) <i>Prunus</i>
Amoerimum, <i>B.</i> near <i>Nathurichon</i>		Chrysobothris, <i>Emm.</i> (near) <i>Prunus</i>
Rhacopilula, <i>B.</i> near <i>Prunus</i>		Chrysobothris, <i>Emm.</i> (near) <i>Prunus</i>
Asparagopsis, K <sup>12</sup> near <i>Asparagopsis</i>		Chrysobothris, <i>Emm.</i> (near) <i>Prunus</i>



## ORDER LXIII. PONTEDERACEÆ.—PONTEDERADS.

Pontederaceæ, *Kunth in Humb. et Bonpl. N. G.* 1. 211. (1815); *Agardh Aph.* 169. (1823).—Pontederaceæ, *Ach. Rich. Nouv. Élém. ed.* 4. 427. (1828); *Endl. Gen. liv. Meisn. Gen.* p. 398. *Kunth Enum.* 4. 119.

DIAGNOSIS.—*Lilial Endogens with a naked perianth, circinate when withering, anthers turned inwards, and mealy albumen.*

Aquatic or marsh-plants. Leaves sheathing at the base, with parallel veins. In the larger species arrow-headed, cordate or dilated. Flowers either solitary or in spikes or umbels, spathaceous, frequently blue, sometimes yellow. Perianth tubular, coloured, 6-parted, more or less irregular, with a circinate æstivation. Stamens arising from the calyx, 6, or 3 opposite the petals; anthers turned inwards, opening lengthwise. Ovary free, more or less completely 3-celled, many-seeded; style 1; stigma simple; ovules anatropal. Capsule 3-celled, occasionally acquiring an adhesion to the perianth, 3-valved, with loculicidal dehiscence. Seeds indefinite, attached to a central axis, ascending; hilum small; embryo with its radicle rather enlarged, orthotropal, in the axis of somewhat mealy albumen.

The aquatic plants comprehended under this name are essentially distinguished by the divisions of their flowers being rolled inwards after flowering, to which may be added mealy albumen, and an indefinite number of seeds. For this reason a plant called *Reussia*, which seems to want the first and last characters, appears to have no business among them. They were referred to Spiderworts by Salisbury, and are considered nearly related to that Order by Achille Richard, who, however, separates them, suggesting their being referable to Lilyworts. There can be no doubt of their close relation to the latter Order, from which they are principally known by their irregular flowers, mealy albumen, and perianth rolling inwards after expansion. *Leptanthus*, however, if it is really one of the Order, has all the habit of a *Potamogeton*, and establishes a connection with the Arrow-grasses. Hooker, who has given an excellent figure of *Eichhornia speciosa* (*B. M. t.* 2932), states that each fibre of the roots has a calyptrate covering at the extremity, similar to that found on the roots of the Duck-weed.

Water-plants found exclusively in North and South America, the East Indies, and tropical Africa.

Very little is known of their uses. *Monochoria vaginalis* is employed in Indian pharmacy in liver-complaints and disorders of the stomach. Rubbed down in butter and drank, it is thought to remove redness of the eyes; powdered and mixed with sugar it is administered in asthma; and when chewed, is said to relieve toothache; brayed with milk it is given in fever; and, finally, when young, is eaten as a pot-herb.—*Endlicher.*



Fig. CXXXIX.

GENERA.

*Heteranthera*, Ruiz et Pav.  
*Buchozia*, Flor. Flum.  
*Heterandra*, Palis.

*Leptanthus*, L. C. Rich.  
*Schottlera*, Willd.  
*Eichhornia*, Kth.

*Pontederia*, Linn.  
*Unisema*, Rafn.  
*Monochoria*, Presl.

NUMBERS. GEN. 6. Sp. 30.

*Juncaginaceæ.*

POSITION.—PONTEDERACEÆ.—Liliaceæ.

*Mayaceæ?*



ALLIANCE XVII. *ALISMACEÆ*.—THE ALISMAL ALLIANCE.

DIAGNOSIS.—*Hypogynous*, (*infernal*), *trichopetaloides* Endogen., with *depressed corolla* and *no albumen*.

These stand in the same relation to hermaphrodite hypogynous Endogenæ as Ordinals and Hydrals to the Alliances with which they are respectively associated. The want of albumen is their great feature. They are however known, in addition, by their corollæ not having any tendency to combine; so that they are in Endogenæ almost what the Crowfoots are to Exogens. And it is to be observed that if it were not for their monocotyledonous embryo there would be no distinguishing such plants as *Alisma* from certain Ranunculi, represented by *Ranunculus permissifolius*. A very few are, I think, such however occur only among the Alismads, and are not liable to be mistaken for any other plants than Hydrals, with none of the Orders in which can they be properly associated. Arrow-grasses offer the lowest organization in the Order, and may be regarded as an Alismal form of Naiads.

This Alliance seems to close the class of Endogenæ, and to stand on the limit of Exogens, in consequence of the intimate and unquestionable relation between *Alisma* and Crowfoots.

## NATURAL ORDERS OF ALISMACEÆ.

<i>Flowers 3-petaloidous. Placenta many-seeded, netted and</i>	} 54. BUDRACEÆ
<i>parietal</i> . . . . .	
<i>Flowers 3-petaloidous. Placenta few-seeded, simple, and</i>	} 55. ALISMACEÆ
<i>axial, or basal. Endogenæ only</i> . . . . .	
<i>Flowers 6-merous. Placenta few-seeded, simple and axile, or basal,</i>	} 56. JUNCAGNACEÆ
<i>slit on one side, with a long large placentula</i> . . . . .	



## ORDER LXIV. BUTOMACEÆ.—BUTOMADS.

Butomææ, *Richard in Mem. Mus.* 1. 364. (1815); *Endl. Gen.* 1. *Meisner, Gen.* p. 365. *Kunth. Enum.* iii. 162.

DIAGNOSIS.—*Alismal Endogens with 3-petaloidous flowers, and many-seeded netted and parietal placenta.*

Aquatic plants. Leaves very cellular, with parallel veins, often yielding a milky juice. Flowers in umbels or solitary, conspicuous, purple, or yellow, or white. Sepals 3, usually herbaceous. Petals 3, petaloid. Stamens definite or indefinite, hypogynous, some of them occasionally abortive. Ovaries free, 3, 6, or more, either distinct or united into a single mass; stigmas the same number as the ovaries, simple; ovules 00, anatropal or campylotropal, attached to a parietal network. Achenia or follicles many-seeded, either distinct and rostrate, or united in a single mass. Seeds minute, very numerous, attached to the whole of the inner surface of the fruit; albumen none; embryo with the same direction as the seed.

These water plants are readily known by their placenta extending over the whole lining of the fruit, which is formed either of separate or concrete carpels. In this respect there is an evident analogy with Water lilies, which *Limnocharis* resembles in the structure of its fruit. De Candolle says that no Endogens are lactescent; but some of these yield milk in abundance. *Limnocharis* offers a singular example of a large conspicuous open hole in the apex of its leaf, apparently destined by nature as an outlet for superfluous moisture, which is constantly draining from it.

The species are natives of the marshes of Europe and Siberia, the North Western provinces of India, and equinoctial America.

*Butomus umbellatus* is acrid and bitter; its rhizome and seeds have been regarded emollient, refrigerant and solvent, and were once official under



Fig. CXL.

the name of *Radix et Semina Junci floridi*. The roasted rhizome is eaten in the North of Asia.

GENERA.

*Butomopsis*, *Kth.*

*Tenagocharis*, *Hochst.*

*Butomus*, *Tourn.*

*Hydrocleis*, *Rich.*

*Limnocharis*, *H. et B.*

NUMBERS. GEN. 4. Sp. 7.

*Nymphaeaceæ.*

POSITION.

BUTOMACEÆ.—Alismaceæ.

Fig. CXL.—1. *Hydrocleis Commersoni*; 2. one of the carpels; 3 the same opened to show the placenta; 4. seed of *Limnocharis Plumieri*; 5. a section of the same.



ORDER LXV. ALISMACEÆ. *Alisma*

Albright, R. Brown *P.* 72, 742, in part (1819); *Ind. on Amer. Mus.* 2, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909,

DIAGNOSIS. *Altemat Entolopus* with 3 petalobed stamens, 1, 2, 3 petals, and 1 basal placenta, and a 3-lobed ovary.

Floating or swamp plants, very rarely annual, usually having a creeping, fleshy, perennial rhizome. Flowers in umbels, racemes or panicles, 2, very rarely singly. Leaves either narrow and strap-shaped, or expanded into a broad blade, always however with the veins parallel. Sepals 3, herbaceous. Petals 3, petaloid. Stamens definite or indefinite; anthers turned inwards. Ovaries superior, several, 1-celled; ovules erect or ascending, solitary, or 2 attached to the suture at a distance from each other, anatropal or campylotropal. Styles and stigmas the same number as the ovaries. Fruit dry, 1- or 2-seeded. Seeds without albumen, hooked; embryo shaped like a horse-shoe, undivided, with the same direction as the seed.

This Order is to Endogens what Crowfoots are to Polypetalous Exogens, and is in like manner recognised by its disunited carpels and hypogynous stamens. Such plants as *Ranunculus parnassifolius* are hardly distinguishable from Alismads by external characters. Arrow-grasses are known by their imperfect floral envelopes, and straight embryo having a lateral slit for the emission of the plumule. On plants belonging to Alismads, Hydrocharitads, Najas, Arrow-grasses, and Equisemads, have all a disproportionately large radicle, whence their embryos were named by the late L. C. Richard, macropodal. The truly diclinous flowers of *Sagittaria* constitute a great and unusual exception to the otherwise hermaphrodite structure of this Order.

Chiefly natives of the northern parts of the world. Several *Sagittaries* and *Dicentra* inhabit the tropics, the former those of both hemispheres.

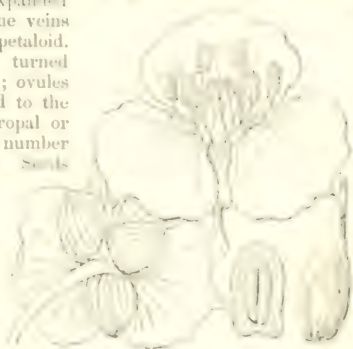
Many have a fleshy rhizome, which is edible; such are *Alisma* and *Sagittaria*; a species of the latter, *S. simulans*, is cultivated for food in China; its herbaceous stem, *Alisma Plantago* and *Sagittaria sagittifolia* are among the plants usually used in hydrophobia; the rhizome of the former, deprived of acridity by drying, is used by the Kalmucks. Various Brazilian *Sagittarias* are very astringent, and their expressed juice is even employed in the preparation of ink.—*Medicinal Botany*, p. 47.

## CONCLUSION

[illegible]

NUMBERS, 618, 3 5, 10.

	<i>C. tenuis</i> , <i>gemmae</i> var.
POSITION.—————	ALGAE MATTER.————
	<i>R. tenuis</i> , <i>gemmae</i> var.



1000000

Fig. CXLII. 1. Flower of *Alisma nanum* (x40); 2. the same (from the front); 3. a section of the ovary; 4. a section of a seed.



## ORDER LXVI. JUNCAGINACEÆ.—ARROW-GRASSES.

Juncaginæ, *Rich. Anal. Fr.* (1808); *Mem. Mus.* 1. 364. (1815); *Endl. Gen.* p. 127; *Meisner*, p. 364; *Kunth Enum.* 3. 141.—*Potamogetonæ*, *Rehb. Fl. Excurs.* 1. 6. (1830).

DIAGNOSIS.—*Alismal Endogens with scaly flowers, few-seeded simple axile or basal placentæ, and an embryo slit on one side, with a very large plumule.*

Herbaceous aquatic or marsh plants, whose leaves have in all cases parallel veins, whether they are narrow and grassy, or broad and quite different from the leaf-stalk.

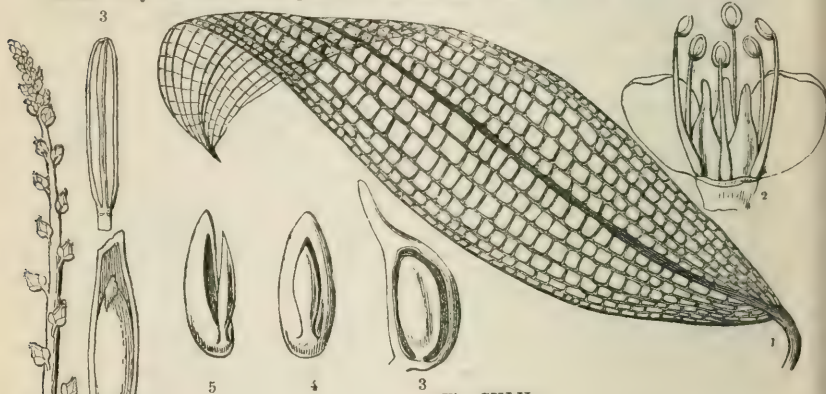


Fig. CXLII.

Flowers ♂, of no conspicuous appearance, white or green, in spikes or racemes. Sepals and petals small and much alike. Stamens 6; anthers usually turned outwards and opening longitudinally. Carpels 3, 4, or 6, free, united or distinct; ovules 1 or 2, approximated at their base, erect or pendulous. Fruit dry, 1- or 2-seeded. Albumen wanting; embryo having the same direction as the seed, with a lateral cleft for the emission of the plumule.

With the exception of their flowers being ♂, there is little to separate these plants from the Naiads, in whose Order some of them have been included by all botanists before this time; for the old distinction of pendulous ovules in the Naiads, and erect ones in Arrow-grasses, fails in consequence of *Caulinia*, and *Naias* itself, having them erect. The plumule lying within a cleft on one side of the embryo indicates a decided tendency on the part of these plants to Arads, and the incomplete condition of their floral envelopes confirms the relationship. The genus *Scheuchzeria* is a transition from Arrow-grasses to Rushes.

Marshy places in most parts of the world may be expected to indicate traces of this Order, which is found in Europe, Asia, and North America, the Cape of Good Hope, and equinoctial America. *Potamogetons* occur in ditches and swamps as far north as Iceland.

*Triglochin* has a salt taste. The root of *Potamogeton natans* is said to be eaten in Siberia; the foliage of others is regarded as styptic.

## GENERA.

*Triglochin*, Linn.  
*Juncago*, Tournef.  
*Tristemon*, Raf.

*Scheuchzeria*, Linn.  
*Ruppia*, L.  
*Potamogeton*, L.

*Peltopsis*, Raf.  
*Aponogeton*, L.  
*Spathium*, Lour.

*Cyanogeton*, Endl.  
*Ouvirandra*, Thouars.  
*Hydrogeton*, Pers.  
*Limnogeton*, Edgew.

## NUMBERS. GEN. 7. Sp. 44.

*Naiadaceæ.*

POSITION.—.—JUNCAGINACEÆ.—Alismaceæ.

*Juncaceæ.*

Fig. CXLIII.—1. Leaf of *Ouvirandra fenestralis*; 2. a flower cut open; 3. section of a ripe carpel of *O. Bernieriana*; 4, 5. embryo in different positions: the thicker part is the cotyledon, the smaller the plumule.

Fig. CXLIII.—*Triglochin palustre*. 1. A flower; 3. a ripe fruit; 4. one ripe carpel opened, and exhibiting a seed; 5. embryo.



CLASS V.—DICTYOGENS.

Retzsch, *Ed. pr.* p. 102. 1800.—*Dictyogena*, *Engelm.* *Bot. Mex.* p. 70.

There is among the plants referred by Jussieu to his *Mimopythecium*, and consequently by later Botanists to Endogens, a small number of species whose foliage and habit of growth are so very peculiar, that the reference of them to Endogens is wholly dependent upon their conformity in the structure of the embryo. They have a broad net-veined foliage, which usually disarticulates with the stem, and in some cases the small green flowers are very nearly the same as those of such plants as *Mimiperymum*, among Exogens. For these reasons I have endeavoured to show that they ought to be regarded as a transition class partaking somewhat of the nature of Endogens and also of that of Exogens. And if we regard merely the foliage, the distinction seems admissible, for no Endogens possess such a character except a few *Arads*, otherwise widely different. The nearest approach to this structure, with which I am acquainted, occurs in *Lilium giganteum*, but the leaves of that plant have a flat foliaceous petiole and do not disarticulate. The broad-leaved *Amaryllids* like *Griffonia*, *Euryeles*, &c., are totally different; their leaves not only having no articulation with the stem, but having no reticulations between the ribs, further than what arises from the anastomosing of the fine parallel secondary veins which connect them.

It is not, however, in the leaves alone that a distinction is found between Endogens and Dictyogens. If the annual branches of a *Smilax* be examined, there is nothing indeed in their internal structure at variance with that of a stem of *Asparagus*; they are exactly Endogenous; but in the rhizome of the whole genus (take the *Sarsaparilla* of the shops for instance) the wood is disposed in a compact circle, below a cortical integument and surrounding a true pith; in that of *Smilax aspera* the woody matter is disposed in the form of a cylinder, enclosing a centre of soft cellular tissue; and the vessels of the cylinder have an evident tendency to arrange themselves in lines forming rays from the centre. In *Dioscorea alata* the stem itself is formed of eight fibrovascular wedges placed in pairs, with their backs touching the bark, surrounding a central pith and having wide medullary plates between them; in fact, when the stems of this plant are in a state of decay, the eight fibrovascular wedges may be pulled asunder, like those of a *Kirschwort* or a *Menisperm*. In the curious *Testudinaria elephantina* the structure of the stem is of nearly the same kind; several bundles of fibrovascular tissue form a circle surrounding a pith, and pierced with broad medullary processes. *Lapageria* and *Philesia* have each a zone of wood below their bark, and a central pith in which the common fibrovascular bundles of Endogens are disposed; a tendency in which is also observable in *Smilax*. It therefore seems that the peculiarities in the foliage of these plants are accompanied by others equally remarkable in the structure of the stem; indeed I do not see why the stem of a common *Yucca* has not as good a title to be regarded Exogenous as Endogenous. Schimper indeed has remarked that he believes it to be the regular structure of the roots of Endogens to have a simple circle of fibrovascular thread bundles; and this seems to be sometimes the case. But I do not find it



in *Strelitzia*, or even in the arborescent *Aloes*, and when it does become evident it is unaccompanied by any peculiarity of the foliage. But, in the perennial stem of *Dictyogens* the bundles are what this Anatomist calls unlimited, that is to say, they go on growing for years together as in *Exogens*.

The principal difficulty about admitting the class of *Dictyogens* seems to me to consist in the small number of genera and species which it comprehends, and in the absence of any evidence as to the stem of the order called *Parids* having the anatomical structure here assigned to it. These objections are undoubtedly deserving of serious consideration; but on the other hand it must be borne in mind that the plants collected under *Dictyogens* agree well with each other, and ill with any alliances of *Endogens*.

The Natural Orders of *Dictyogens* are poor in species, and can hardly be considered as established on recognised characters. The following are the distinctions, as far as they can be at present pointed out.

#### NATURAL ORDERS OF DICTYOGENS.

<i>Flowers</i> ♂ ♀. <i>Perianth</i> adherent. <i>Carpels</i> consolidated, several-seeded . . . . .	} 68. DIOSCOREACEÆ.
<i>Flowers</i> ♂ ♀. <i>Carpels</i> several, quite consolidated. <i>Placentæ</i> axile. <i>Flowers</i> hexapetaloidous . . . . .	} 69. SMILACEÆ.
<i>Flowers</i> ♂. <i>Carpels</i> several, quite consolidated. <i>Placentæ</i> parietal. <i>Flowers</i> 3-6-petaloidous . . . . .	} 70. PHILESIACEÆ.
<i>Flowers</i> ♂. <i>Carpels</i> several, half consolidated. <i>Placentæ</i> axile. <i>Flowers</i> 3-petaloidous . . . . .	} 71. TRILLIACEÆ.
<i>Flowers</i> ♀. <i>Carpels</i> solitary, simple, many-seeded, with long-stalked anatropal seeds and a basal placenta . . . . .	} 72. ROXBURGHACEÆ.

In the *Flora Antarctica*, vol. II., p. 355, the foregoing views are ably combatted by Dr. Hooker, who is unwilling to admit the propriety of recognising this class. He considers that *Callixene* and *Drymophila*, here placed among *Liliads*, undoubtedly connect those *Endogens* with *Sarsaparillas* through *Lapageria* and *Philesia*. I do not, however, feel disposed to abandon the opinions here expressed; although it is very possible that some genera now stationed among *Endogens* may require removal hither, and others placed here to be excluded. If there is always a woody zone in the stem of *Callixene*, as Dr. Hooker found, then it may be more proper to consider whether that genus is not a *Smilaceous Dictyogen*, than to reject the class of *Dictyogens* itself. Dr. Hooker found the stem of *Philesia* essentially such as is here described, (his description and mine differ more in appearance than in reality,) and that of *Lapageria rosea* composed almost wholly of woody matter concentrated externally into a well-defined zone. For my own part I am so little inclined to abandon the opinions here expressed, that it seems more probable that the class ought actually to be strengthened by the admission of *Aristolochiads*.



## ORDER LXVIII. DIOSCOREACEAE.—Yams.

*Dioscorea*, *R. Brown Plant.* 244 (1810); *Species* 496—103, 1000. *Act. bot.* *Rept. Hort. bot.* 1828. *Fruct. bot.* 1829. *Dioscoreaceae*, *Ed. de Mart.*, *Monoc. gener.*

**DIAGNOSIS.**—*Dioscorea* with unisexual flowers, the adjacent perianth, and somewhat unequal-sized sepals.

Twining shrubs, with large tubers either above or below ground. Leaves alternate, occasionally opposite, with reticulated veins. Petioles small, spiral, with three or four bracts each,  $\frac{1}{2}$  to  $\frac{1}{3}$ . Calyx and corolla confluent, leathery, adnate. Stamens 6, inserted into the base of the corolla but passing without touching it, bearing longish filaments. Ovary adnate, lobed, with three rounded lobes; style deeply trifid; stigma undivided, sessile, suspended, anatropal. Fruit fleshy, compressed, with two of its sides sometimes divergent; occasionally succulent. Seeds two or each cell, or by abortion solitary, compressed, curved or sigmoid, or in the succulent species reniform; embryo small, near the base, lying in a large cavity of nutmeg-like albumen.



FIG. CXLV.

an article of food in tropical countries as the Potato in Europe. The young shoots of *Tamus communis* (the *acrotis acrota* of Dioscorides, and often of the modern Greeks) and also of *T. crotia*, are eaten in Greece like Asparagus, as we have from Dioscorid. but Endlicher says, that unless they are well boiled (*plungantur copiose*) they are powerfully purgative, and even emetic.

Fig. CXLV.—*Dioscorea alata* (Taro). 1. A small tuberous root. 2. A flower. 3. A fruit.



The embryo of some genera (*Dioscorea*, and *Rajania*) consists of a small oblong plumule lying at the base of a thin veiny flattened cotyledon, and bears much resemblance to some Dicotyledonous embryo with one cotyledon cut off. A similar condition of the parts occurs in all except *Tamus*; whence an additional argument may be drawn for considering this order at least as being intermediate between Exogens and Endogens.

# GENERA.

<i>Tamus</i> , <i>L.</i>	<i>Jamraja</i> , <i>Plum.</i>	§ <i>Amphistemon</i> , <i>Gris.</i>	§ <i>Hemidematostemon</i> , <i>Gris.</i>
<i>Tamus</i> , <i>Juss.</i>	<i>Dioscorea</i> , <i>L.</i>	§ <i>Epistemon</i> , <i>Gris.</i>	
<i>Testudinaria</i> , <i>Salisb.</i>	<i>Ubiom</i> , <i>Rumph.</i>	§ <i>Lychnostemon</i> , <i>Gris.</i>	<i>Oncus</i> , <i>Lour.</i>
<i>Helmia</i> , <i>Kth.</i>	§ <i>Centrostemon</i> , <i>Gris.</i>	§ <i>Allactostemon</i> , <i>Gris.</i>	<i>Podianthus</i> , <i>Schneitzl.</i>
<i>Rajania</i> , <i>L.</i>	§ <i>Dematostemon</i> , <i>Gris.</i>	<i>Illomene</i> , <i>Mart.</i>	

# NUMBERS. GEN. 7. Sp. 150.

POSITION. ——— DIOSCOREACEÆ.—Similacæ.

*Aristolochiaceæ.*



## ORDER LXIX. SMILACEÆ.—SARSAPARILLACÆ.

*Smilax, L. f. gener. et spec. Orb.*

DIAGNOSIS.—*Dictyopetal* with bipinnate or palmately bipinnatifid leaves, axillary, sessile, rounded or ovate, and with pinnules



FIG. CXLVI.

Herbaceous plants or under-shrubs, with a tendency to climb, and sometimes having fleshy tubers. Stems scarcely woody. Leaves reticulated. Flowers ♂ or ♀. Calyx and corolla bell-shaped, 5-lobed. Stamens 6, inserted into the throat near the base; seldom hypogynous. Ovary 3-lobed, the cells 1- or many-seeded; style usually 3-lobed; stigma 3; ovules orthotropal. Fruit a round berry. Alliance between *Indica* and *europæica*; embryo very small, usually distinct from the albumen.

From what has been already said in a previous page, it is obvious that the Order of *Sarsaparillacæ*, in

I understand it, is very different from that of other botanists. Its nearest affinities are with *Lilies* on the one hand, from which its reticulated leaves and quadrangular rhizomes distinguish it, and on the other with *Parids*, whose *tricuspidate* leaves afford a clear mark of distinction.

The species are found in small quantities in most parts of the world, especially in the temperate and tropical parts of Asia and America.

The diuretic demulcent powers of *Sarsaparilla* are well known. This being so, the produce of many species of *Smilax*; as *S. Purshiana*, a *Pennsylv.* species lately extolled by Ruiz; *Smilax medica*, which furnishes the *Sarsaparilla* of *Asia*; *S. siphilitica*, which, according to Dr. Persing, yields the *Lilium* or *Dracunculus*; and *S. officinalis*, which the same acute pharmacist supposed to be the *Maranta* *Sarsaparilla*, the best in the English market. Dr. HARRIS maintains that the only *Sarsaparilla* to be relied upon for medical use, is that of the *Rio Negro*. Martin says *officinalis* from that *S. papyracea* (*officinalis*, Pöpp.) yields *Brasilia* or *Lilium* *Sarsaparilla*, and that many others are of medical value. It also appears that a considerable quantity of *Smilax glycyphylla*, of excellent quality, has been imported from New Holland, the leaves of

FIG. CXLVI. *Smilax glycyphylla*. 1. A single stamen. 2. A pistil. 3. A longitudinal section of the ovary. 4. A seed. 5. A cross-section of the fruit.

FIG. CXLVII.—1. Flower of *Smilax medica*. 2. A longitudinal section of the fruit.



this plant are known under the name of Sweet Tea. Various Asiatic species, such as *S. zeylanica*, *glabra*, *perfoliata*, and *leucophylla*, are reputed to be little different in their qualities from the American species. *Smilax excelsa* and *aspera* are common substitutes in the south of Europe; according to Dr. Walsh (*Hort. Trans.* vi. 41), the root of both *S. aspera* and *S. excelsa*, which abound on the hills and in the woods on both sides of the Bosphorus, is used in decoction, like Sarsaparilla, for which it is sometimes substituted. Nees and Ebermaier say that it sometimes comes into the market under the name of Italian Sarsaparilla, but that it has little resemblance to the genuine drug. *Smilax China* has a large fleshy root, the decoction of which is supposed to have virtues equal to that of Sarsaparilla, in improving the health after the use of mercury. According to the Abbé Rochon, the Chinese often eat it instead of Rice, and it contributes to make them lusty.—*Ainslie*, 1. 70.

Roxburgh informs us that the large tuberous rhizomes of *S. lanceæfolia* are much used by the natives of India, and are not to be distinguished from China root. The juice of the fresh tuber is taken inwardly for the cure of rheumatic affections, and the refuse, after extracting the juice, is laid over the parts most painful. American China root is reported to belong to this plant; but several species seem to be mixed together by botanists under this name. Elliot says that he believes *Smilax Pseudo-China* to be the one generally preferred in medicine as an alterative, and that it forms the basis of many diet drinks among the unlicensed faculty of the United States. From the tubers, with maize, sassafras and molasses, the negroes of Carolina manufacture a very pleasant beer.

#### GENERA.

*Smilax*, *L.*  
*Ripogonum*, *Forst.*

NUMBERS. GEN. 2. Sp. 120.

*Menispermaceæ.*

POSITION.—*Dioscoreaceæ*.—*SMILACEÆ*.—*Trilliaceæ*.  
*Liliaceæ*.

#### ADDITIONAL GENERA.

*Coprosmanthus*, *Kth.* | *Heterosmilax*, *Kth.*



## Olfert, LXX, PHILIPSLAND - Philadelphus

Philester, *Fl. pr. europe et aff.* (1867), *Ind. bot. p. 117*—Flourens, *Ind. bot. p. 11*, 1868.

DIAGNOSIS.—*Distaplia* with bilobed telopores, distinct from *unilobata* and *parvifolia*.

Twining or upright shrubs, with ridged or 5-angled stems, sometimes branched, with the leaves large, showy, . . . solitary, only at the base . . . . .  
with the calyx coloured, membranous and short, or hexapetalous, with the sepals and petals equal and similar. Stamens 6, inserted into the base of the perianth; anthers linear, opening longitudinally. Ovary 1-celled, free, with 3 parietal placentæ; style long, club-shaped; stigmas 3; ovules 60, orthotropous, enveloped in mucilage. Fruit succulent. Nothing more known with certainty, except that the seeds of *Lapageria* are obovate, horny, and buried in pulp, according to the *Flora Peruviana*.

In the last edition of this work I regarded these plants as forming a part of the Rostkuch-worts; but the discovery by Mr. Griffith, that the carpel of these plants is quite simple, and a further consideration of the parietal placenta, orthotropal ovules, and hexamerous flowers of the *Phlœsiads*, has decided me to separate them, in the belief that recruits may be hereafter found for them. Very little is known about them at present; no one has analysed their seeds, and it is even doubtful whether the two genera supposed. For my part, I only see *Simulax* bearing the flowers of a *B.*

Chili, especially its southern provinces, produces all we need for the use of these plants.

Lapageria rosea, a most beautiful twiner, is said to have great medicinal properties, and its root like Sarsaparilla in quality.

## CONCLUSION

Nimble, the 2.5-ton

POSITIONS: *Callitriche*, *Phytolacca*, *Urtica*, *Salix*, *Juniperus*, *Amorpha*.

Fig. CXLVIII. 1.—*Phallus brevicauda*. 2.—Magnified Egg, showing its structure and its ovule.



## ORDER LXXI. TRILLIACEÆ.—PARIDS.

Trilliaceæ, *DC. Propr. Med.* 294. (1816); *A. Gray, Ann. Lyc. N. York*, 4. 106.—*Parideæ, Link Handb.* 1. 277. (1829); *Endl. Gen.* p. 153; *Meisn. Gen.* p. 403.

DIAGNOSIS.—*Dictyogens* with bisexual tripetaloidous flowers, half consolidated carpels and axile placentæ.

Simple-stemmed herbaceous plants with tubers or rhizomes, and verticillate membranous netted leaves. Flowers large, terminal, solitary, ♂. Sepals 3, herbaceous. Petals 3, much larger, coloured, or herbaceous. Sometimes one-fourth is added to their parts. Stamens 6-10; filaments subulate; anthers linear, with cells on their edges, and the connective extended beyond them. Ovary free, 3-5-celled; styles as many, distinct; stigmas inconspicuous; ovules 00, in 2 rows, anatropal, ascending. Fruit succulent, 3-5-celled. Seeds 00, with a leathery brownish skin; embryo minute, in fleshy albumen.

These plants have been generally included in *Sarsaparillas*, from which they differ somewhat as *Spiderworts* from *Lilies*.

They are found in thickets in the temperate parts of Europe, Asia, and North America.

*Paris quadrifolia* is reckoned a narcotic acrid poison. The root of *Medeola virginica* is emetic and diuretic. *Trillium cernuum* and sessile have rhizomes that are violently emetic, and their fruit is suspicious; the juice of the berries mixed with alum gives a blue colouring matter.

## GENERA.

*Paris*, *Linn.*  
*Demidovia*, *Hoffm.*  
*Trillium*, *Mill.*  
*Phyllantherum*, *Rafin.*  
*Delostylys*, *Rafin.*  
 ? *Medeola*, *Gronov.*  
*Gyromia*, *Nutt.*

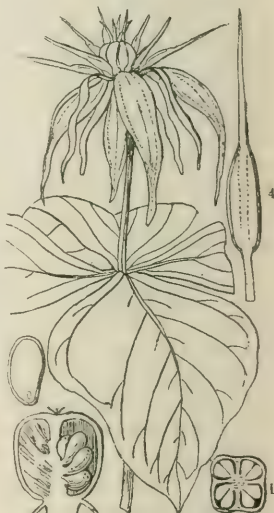


Fig. CXLIX.

*Trillidium*, *Kth.*  
 ? *Streptolirion*, *Edg.*

NUMBERS. GEN. 4. Sp. 30.

*Melanthaceæ.*  
 POSITION.—*Smilacææ*.—*TRILLIACEÆ*.—*Roxburghiaceæ.*  
*Commelynacææ.*

Fig. CXLIX.—*Paris quadrifolia*. 1. A transverse section of an ovary; 2. perpendicular section of the ripe fruit; 3. longitudinal section of a seed; 4. an anther.



ORDER LXXII. ROXBURGHIAEAE.—*Roxburghia* Endl.

Roxburghiaef. HORT. FRUIT. AC. BAR. II. 1822. (Cult. SIMS. 30. 1820.) Bot. Beech. I. 1.  
Meyenb. Gen. p. 402. *Gleditsia* Endl. Gener. nov. 1820. p. 10.

DIAGNOSIS.—*Dictyogenes* with biserial stamens, solitary strongly unguiculate carpels, with long stalked anatropal ovules, and a broad placenta.

Twining shrubs with tuberous roots? Leaves pinnate and compound, with pinnate secondary veins connecting several primary ribs. Flowers large, half-merry, somewhat foetid. Perianth of 4 large petaloid divisions. Stamens 4, hypogynous; anthers adnate, opening inwards, pointed, with connectives projecting far beyond the cells, which separate from the latter as far as their bases. Ovary superior, 1-celled, with 2 poly-spermous placentae arising from the very base of the pericarp; style none; stigma somewhat pencil-shaped; ovules 00, anatropal. Pericarp 1-celled, 2-valved, with 2 clusters of seeds at the base. Seeds attached to long cords covered with loose hairs just below the seeds; embryo taper, in the axis of fleshy albumen, with the plumule lying within a slit.



FIG. CL

The affinity of this singular genus is not sufficiently marked to enable us to refer it to any known Natural Order: by Endlicher it is placed at the end of *Sapropentaceae*, and there can in fact be no doubt about its relation to the Family, which alone amongst includes in the Smilacaceae Order. I, however, formerly regarded it as more nearly allied to Arads than to anything else, and Mr. Griffith has no far-spread made this opinion as to consider it certainly one of the class of which Arads are the type, in which he has apparently been influenced by the discovery of a slit in the axis of the embryo. But this character has lost its value even since the discovery by Ait. in Jussieu that a slit embryo is found very generally in *Euphorbia*, and a dichotomous inflorescence is indispensable to Arads, so that the show of the affinity of *Dictyogenes* can hardly be maintained. It would rather appear to be the type of an Order, the recruits to which we have still to look. In the meanwhile it may be looked upon as a tendency towards Arads on the part of *Dictyogenes*. *Roxburghia* seemed to have more 100 fathoms long. Mr. Griffith regards the plant as consisting, beyond all doubt, of one carpel only, as "is indicated by the obliquity of the ovary." *Trichostema* contains an ovary



described, is the result of its maturation, and has no existence in the young state of the organ.

The plants of this small Order are natives of the hotter parts of India.

The roots of *Roxburghia*, previously prepared with limewater, are candied with sugar and taken with tea. Their flavour is insipid.—*Roxb.*

GENERA.

*Roxburghia*, Dryand.

*Stemona*, Lour.

*Ubiu*, Rumph.

NUMBERS. GEN. 1. Sp. 4.

POSITION.—Smilacæ.—ROXBURGHACEÆ.—Trilliaceæ.

*Aracæ.*



## CLASS VI. GYMNOGENS.

Synonymat, *Reich. Arch. du Fr. Part. II.* (1816) — 1945. — *Gymnogones*, *Ann. du Mus. Nat. Hist. Nat.* (1825) — *Gymnospermæ*, *Nomencl. Bot.* (1825) — *Gymnosperms*, *Bot. History*, Ed. 2d, p. 10, 11.

The plants comprehended in this class have nearly an equal relation to flowering and flowerless plants. With the former they agree in habit, in the presence of sexes, and in their vascular tissue being complete; with Ferns and Clubmosses, among the latter, some also accord by habit, in the peculiar gyrate veneration of the leaves of some Cycads, in their spiral vessels being imperfectly formed, and in the sexes being less complete than in other flowering plants: the females wanting a pericarpel enclosing, and receiving fertilisation directly through the foramen of the ovule, without the intervention of style or stigma, and the males sometimes contracting of leaves imperfectly contracted into an anther bearing a number of pollen cases upon their surface. So great is the resemblance between Clubmosses and certain Conifers, that I know of no obvious external characters, except size, by which they can be distinguished. Gymnogones are known from most other Vasculars by the vessels of their wood having large apparent perforations or disks. It is not, however, on this account to be understood that they differ in growth from other Exogens; on the contrary, they are essentially the same, deviating in no respect from the plan upon which Exogenous plants increase, but having a kind of tissue peculiar to themselves.

At this point of the vegetable kingdom there is a point of transition from the highest form of organization to the lowest. Gymnogones are essentially Exogens in all that appertains to their organs of vegetation: they have concentric zones in their wood, a vascular system in which spiral vessels are found, and a central pith; but they are analogous to reptiles in the animal kingdom, inasmuch as their ova are fertilized by direct contact with the male principle. The two most remarkable of the Orders are Cycadites and Cycads. Of these, the former is connected with Chloromites, among Acrogens by means of the extinct genus *Lepidodendron* (see *Plant. Fossil.* vol. 2. t. 98), and their branches are sometimes so similar to those of certain Lycopods themselves, as to leave no doubt of their relation. *Compositæ*, for instance, *Lycopodium Phlegmaria*, and *Cunninghamia stricta*. Some Cycads have the gyrate veneration of the leaves of true Ferns, along with the inflorescence of Conifers; and their mode of forming three vessels, although essentially the same as that of Exogens, yet resembles the growth of Acrogens in lengthening by a terminal bud only. While, however, the class of Gymnogones is thus distinctly marked by the most important physiological peculiarities, it approaches the highest form of vegetation by that portion of it which bears the name of Joint-stem plants, even all the structure of their class, but with the manner of growth of Chloromites and Hedyotis, which will be found in a future part of this classification.



## THE NATURAL ORDERS OF GYMNOGENS.

- |   |   |                 |
|---|---|-----------------|
| <i>Stem simple, continuous. Leaves parallel-veined, pinnate. Scales of the cone antheriferous . . . . .</i>   | } | 73. CYCADEACEÆ. |
|   |   |                 |
| <i>Stem repeatedly branched, continuous. Leaves simple, acrosc. Females in cones . . . . .</i>  | } | 74. PINACEÆ.    |
|   |   |                 |
| <i>Stem repeatedly branched, continuous. Leaves simple, often fork-veined. Females solitary. Membrane next the nucleus inclosed. Anthers 2-celled, opening longitudinally . . . . .</i> | } | 75. TAXACEÆ.    |
|   |   |                 |
| <i>Stem repeatedly branched, jointed. Leaves simple, net-veined. Membrane next the nucleus tubular, protruded. Anthers 1-celled, opening by pores . . . . .</i>                         | } | 76. GNETACEÆ.   |
|   |   |                 |



## ORDER LXXIII. CYCADEACEÆ. — Cycas.

*Cycas*. *Rich. in Pers. Synops.* 2: 69 (1802). *Botanic Prodr.* 346 (1815). *Bot. Beechey*. *Trans. of Amer. Nov. Gen. et Sp.* 2: 1 (1817). *R. Brown*. *Proc. Linn. Soc. New South Wales*, (1820), 1821. *At. Brown*. *Trans. of Linn. Soc. New South Wales*, 1820. *Myers*. *Proc. Linn. Soc. New South Wales*, 1820. *Cycadeacea*, *Det. præs.* (1820). *Endl. Gen.* XXXIII.

**DIAGNOSIS.**—*Gymnosperms with a simple, continuous stem; perulliferous, pinnate leaves; cone-bearing; and a single seed.*

Small trees or shrubs, sometimes resembling Palm trees in their aspect. The stems are either simple and cylindrical, or spheroidal, or dichotomously branched, and in all cases strongly marked with the lozenge-shaped scars of broad woody leaf-stalks. Internally the stem consists of a mass of pith, traversed by woody bundles, and rings of woody matter, sometimes irregularly disposed, sometimes collected into regular



FIG. C.LI.

simple veins, and are placed somewhat obliquely on their pattern, from which they are disarticulate. (Miquel regards these leaves as a sort of bract, "bractes de palmier," *l.c.*) Flowers  $\sigma$  &  $\text{♀}$ , perfectly destitute of all trace of calyx and corolla.  $\text{♂}$  collected in terminal cones, consisting of stamens covered over their base by small, entire, which are one-celled, often collected in twos and threes, and split longitudinally. Pollen lodges

FIG. C.LI. — *Cycas circinalis*: 1, a portion of a female fruit; 2, a single seed; 3, a single seed; 4, embryo.

FIG. C.LII. — Leaves of *Zamia*.



FIG. C.LII.

and narrow, cylindrical, and always joined by numerous plates. The cone consists of pinnate, green, and erect leaves. The leaves are green, hard and woody, becoming gradually smaller with young, but becoming more (the) the leaves have the



angular, collected in masses. ♀ consisting of naked ovules, placed beneath peltate scales, or at the base of flat ones, or on the margins of contracted leaves. Seeds hard or spongy-coated nuts, with one or more embryos suspended by a long funiculus in a central cavity of large white fleshy or mealy albumen; the cotyledons unequal, more or less connate; radicle superior.

One of the botanists who originally noticed the plants that constitute this Order referred them to Ferns; an opinion to which Linnaeus, having first adopted the idea of Adanson that they were related to Palms, finally acceded. He was followed by others, until, after some suggestions by Ventenat that the genera *Cycas* and *Zamia* ought to form a particular tribe, the present Order was finally characterised by the late L. C. Richard in Persoon's *Synopsis*, in 1807, with the observation that it was intermediate between Ferns and Palms. The opinion of the affinity to Ferns seems to have been thus generally adopted in consequence of the striking resemblance on the part of most species in the mode of developing their leaves; but the supposed relation to Palms was suggested rather by a vague notion of some general similarity, as, for instance, in their cylindrical trunks, than by any precise knowledge of the structure of Cycads. It is only within a few years that more accurate inquiries have determined the real nature of their affinities. In 1825, the publication of Brown's remarks upon the ovule, in which he demonstrated the similarity of conformation between the flowers of Cycads and Conifers, suggested new ideas of the affinities of both Orders; and the determination, in 1829, by Adolphe Brongniart, of the resemblance between them in the structure of the vessels of their wood, while it decided the near relation of Conifers and Cycads, confirmed the proximity of the latter to Ferns, and showed the inaccuracy of the ideas formerly held of a close resemblance between the latter and Palms. With regard to the nature of the evidence by which their strict relation to Conifers is established, it may be observed, that they both are dicotyledonous in seed, both have naked ovules constructed in a similar remarkable manner, and borne in both cases not upon an ordinary axis of growth, but upon the margin or face of metamorphosed leaves; that they have the same peculiar form of inflorescence, the same kind of male flowers, the same constant separation of sexes; that there is a like imperfect formation of spiral vessels; and that they both agree in having the vessels of their wood marked with circular disks; a character which, if not confined to them, is uncommon elsewhere. The difference between the cylindrical simple stem of Cycads and the branched conical one of Conifers arises from the terminal bud only of the former developing, its axillary ones all being uniformly latent, unless called into life by some accidental circumstance, as in the case recorded in the *Horticultural Transactions*, 6. 501; while in Conifers a constant tendency to a rapid evolution of leaf-buds takes place in every axil. With regard to their foliage, on which the difference of aspect chiefly depends, the leaves of Firs are minute and undivided, while those of Cycads are very large and pinnated; in Conifers there is a tendency to a higher development in the scales of the cones, while in Cycads there is a corresponding contraction, firstly in *Cycas* itself, and especially in *Zamia*, in which it takes place to exactly the same point as the evolution of Conifers. To this it may be added that the cones of *Araucaria*, among Firs, and of *Dion* among Cycads, are almost undistinguishable.

Natives of the tropics and temperate parts of America and Asia; but not found in equinoctial Africa, although they exist at the Cape of Good Hope and in Madagascar.—*Brown Congo*, 464. *Dion edule* occurs in Mexico, where it seems to be common in some places. According to Mr. Bunbury, *Zamias* are among the forms of vegetation that characterise the eastern part of the colony of the Cape of Good Hope, especially the great tract of thicket extending along the Caffer frontier.—*Lond. Journ. Bot.* 2. 40. Upon the west coast of New Holland a *Zamia*, supposed to be *Macrozamia spiralis*, grows to the height of 30 feet. The undoubted remains of Cycads attest their having once formed a considerable portion of the vegetation of Great Britain!

All the species abound in a mucilaginous nauseous juice. With this, however, is mixed, in many instances, a very considerable quantity of starch, whence they are common articles of food in the countries where they grow. At the Cape of Good Hope various species of *Encephalartos* are called Cafferbread. The great seeds of *Dion edule* furnish a kind of Arrowroot in Mexico. A similar material of excellent quality is extracted in the Bahamas and other West India islands from *Zamia pumila* and other dwarf species. In Japan a kind of sago is procured from the cellular substance occupying the interior of the stem of *Cycas revoluta*. This is said by Thunberg to be held in the highest esteem; soldiers are able to exist for a long time upon a very small quantity of it, and it is contrary to the laws of Japan to take the trees out of the country. The nuts are also eatable. So also is a sort of sago extracted from *Cycas circinalis*, whose fruit is eaten in the Moluccas, and a kind of flour of bad quality is procured from



the kernels pounded in a mortar. It is supposed that the gummy green by which the true sago being the produce of the plant is a mistake. The sago-stem yields a strong transparent gum something like tragacanth, which when dried in the air, conglutinates into a gummy mass which is applied to malignant ulcers, in which it exerts a powerful in an incredibly short space of time.—*Encyc.*

## GENERA.

Cycas, L.	Zamia, L.	Tamara, L.	Macrozamia, L.
Dioon, Lindl.	Artemesia, R. & A.	Macrozamia, M.	Macrozamia, M.
Platanus, Z.			

NUMBERS. GEN. 6. SP. 16.

## FAMILIES

POSITION.—PHACOC.—CYCADEACEÆ

## Palmetum



FIG. CLIII.

For an account of the structure of the stem of *Cycas revoluta*, see *Annals of Natural Hist. Soc. Lond.* 3 ser. III. 193; V. 11. *Annals of Natural Hist. Soc. Lond.*

FIG. CLIII.—Male plant of *Cycas revoluta* L., showing the strobili and the fronds. The plant is presented in the lower part of the illustration.



## ORDER LXXIV. PINACEÆ.—CONIFERS.

Coniferae, *Juss. Gen.* 411. (1789); *Brown in King's Voyage, Appendix*, (1825); *Rich. Monogr.* (1826).—*Abietinae et Cupressinae*, *Rich. l. c.* (1826); *Bartl. Ord. Nat.* 94 et 95. (1830); *Endl. Gen.* lxxvi. and lxxvii.; *Meisner*, p. 352.—*Cunninghamiaceae*, *Siebold, Fl. Jap. tt.* 101, 102.—*Conaceae*, *Lindl. Key*, No. 232. (1835).

DIAGNOSIS.—*Gymnogens with a repeatedly branched continuous stem, simple acerose leaves, and females in cones.*

These are noble trees or evergreen shrubs, with a branched trunk abounding in resin.

Wood with the ligneous tissue marked with circular disks. Leaves linear, acerose or lanceolate, entire at the margins; sometimes fascicled in consequence of the non-development of the branch to which they belong; when fascicled, the primordial leaf to which they are then axillary is membranous, and enwraps them like a sheath. Flowers ♂ ♀, naked. ♂ monandrous or monadelphous; each floret consisting of a single stamen, or of a few united, collected in a deciduous amentum, about a common rachis; anthers 2-lobed or many-lobed, bursting longitudinally; often terminated by a crest, which is an unconverted portion of the scale out of which each stamen is formed; ♀ in cones. Ovary spread open, and having the appearance of a flat scale destitute of style or stigma, and arising from the axil of a membranous bract. Ovule naked; in pairs or several, on the face of the ovary, inverted, and consisting of 1 or 2 membranes open at the apex, together with a nucleus. Fruit consisting of a cone



Fig. CLIV.

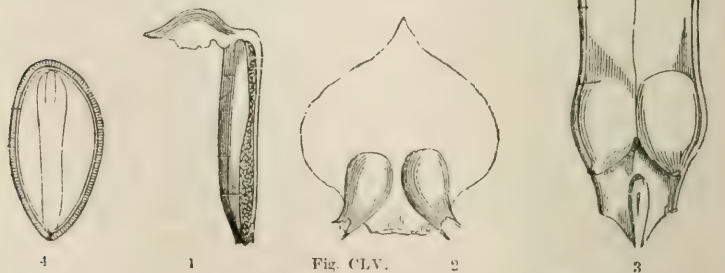


Fig. CLV.

Fig. CLIV.—*Pinus sylvestris*.  
Fig. CLV.—1. side view of an anther; 2. carpellary scale and pair of inverted ovules; 3. inside of ripe scale and seeds; 4. section of the seed, minus the wing at its base.



formed of the scale-shaped ovaries, become enlarged and hardened), and sometimes of the bracts also, which are sometimes obliterated, and sometimes extend beyond the scales in the form of a lobed appendage. Seed with a hard, sometimes indurated embryo in the midst of fleshy oily albumen, with 2 or many opposite seed lobes; the radicle next the apex of the seed, and having an organic connection with the albumen.

With the exception of Orchids, there is perhaps no Natural Order the structure of which remained so long and universally misunderstood as that of Conifers. This has arisen from the anomalous nature of their organisation, and from the investigations of botanists not having been conducted with that attention to logical procedure which is now found to be indispensable. It is not expedient to enter upon an inquiry into the ideas that botanists have successively entertained upon the subject. Those who are desirous of satisfying themselves upon that point will find all they can desire in the Appendix to Captain King's *Voyage to New Holland*, and in Richard's *Memoires sur les Conifères de l'Asie Occidentale*. It may, however, be useful to advert briefly to the principal theories which have met with advocates. These are, firstly, that the female flowers consist of a foliaceous ovary having a style in the form of an external scale, an opinion held by Jussieu, Smith, and Lambert; secondly, that they have a minute coherent perianth, and an external additional envelope called the cupule; this view was taken by Schubert, Mirbel, and others; thirdly, that they have a monosepalous calyx coherent more or less with the ovary, contracted and often tubular at the apex, with a lobed, or glandular, or sometimes entire limb, an erect ovary, a single pendulous ovule, no style, and a minute sessile stigma; this explanation is that of Richard, published in his *Memoir upon the subject in 1809*. It appears, however, from the observations of Brown, that the female organ of Conifers is a naked ovule, the integuments of which have been mistaken for floral envelope, and the apex of whose nucleus has been considered a stigma. About the accuracy of this view there is at this time no difference of opinion. These female organs, or naked ovules, originate from the larger scales of the cone towards their base, and occupy the same relative place in Conifers and in *Zamia*, a genus of Cycads. Now, as there cannot be any doubt of the perfect analogy that exists between the scales of the cone of *Zamia* and the fruit-bearing leaves of *Cycas*, the former differing from the latter only in each being reduced to 2 ovules, and to an undivided state; so there can be no doubt of the equally exact analogy between the scales of Conifers and *Zamia*, and therefore the former would be called reduced leaves if the general character of the tribe was to produce a highly developed foliage; but as the foliage of Conifers is in a much more contracted state than the scales of their cones, the latter must be understood to be the leaves of Conifers in a more developed state than usual. That the scales of the cone really are metamorphosed leaves, is apparent not only from this reasoning, but from the following facts. They occupy the same position with respect to the bracts as the latter do to their membranous sheaths; they surround the axis of growth as leaves do, and usually terminate it; but in some cases, as in the Larch, the axis sometimes elongates beyond them, and leaves them collected round it in the middle. In *Araucaria* a few have absolutely the same structure as the ordinary leaves; and finally, they sometimes assume the common appearance of leaves, as is represented in Richard's *Memoir*, vol. 12., in the case of a monstrous *Abies*. The scales of the cones of Conifers and fruit-bearing Cycads are therefore to these Orders, what carpellary leaves are to other plants. Schleiden does not, however, admit the scales of the cone of *Abies* to be expanded carpellary leaves. He regards them as no other than the axillary buds of carpellary leaves; they, he says, cannot be the latter, because *fidem adhibere debet* without example in the whole vegetable world. *Ann. S. N. S.* xii. 274. We would ask this ingenious anatomist what the fruit of *Salix* is but *fidem adhibere debet*.

With regard to the male flowers, it is obvious that in the Larch, the Cedar of Lebanon, the Spruce, and the like, each anther is formed of a partially contracted scale, analogous to the indurated carpellary scale of the females; and therefore each anther consists of a number of monandrous naked male flowers, collected about a common axis. Some botanists, however, consider each male catkin as a single monandrous male flower, which is impossible. But in *Araucaria*, these catkins occupy the same sort of an ordinary flat scale. In this genus, and such others as agree with it in structure, the anthers may be considered to consist of an uncertain number of lobes, and in this respect to recede from the usual structure of the male organs of plants. In *Conium*, the anthers of which are normal, we have 2; in *Juniperus*, the like number; in *Cunninghamia*, but 4; in *Agathis*, 14; and in *Araucaria*, from 12 to 20. Brown remarks, what is certainly very remarkable, that in *Cunninghamia* the lobes of the anther agree in number, as well as in insertion and direction, with the ovules. *Kew's Appendix*, 11. The same writer has noticed a very general tendency in some species of *Ficus* and *Alice* to produce several embryos in a seed, (*4th Report of Brit. Assoc. 1845*, p. 101.) where also are some curious remarks upon the origin of the embryo in such plants.



Conifers are broken up by many modern botanists into 2 Orders, Abietæ and Cupressæ, the distinctive characters of which are given below. But I regard the cones as the true mark of Conifers, and consequently, such groups as mere divisions of the same Natural Order. Recently, Mr. Bennett has given the weight of his authority in favour of the separation of the two groups, relying upon the pollen of Abietæ having a curved



Fig. CLVI.

oval form, dark granular extremities, and an intermediate band; while Cupressæ have spheroidal grains whose outer coats are ruptured and thrown off, in consequence of the great capacity for absorbing moisture

possessed by the mucous matter surrounding the inner coat. But however beautiful this distinction may be in theory, it is by no means clear that it is of value in practice. Indeed, Mr. Bennett admits, that "it is not always a safe criterion in systematic arrangement;" and a comparison of his own statements with those of Mohl and others does not increase confidence in its importance. I, however, admit two well-defined groups, one of which has the ovules inverted and the others erect.

Natives of various parts of the world, from the perpetual snows and inclement climate of arctic America, to the hottest regions of the Indian Archipelago. The principal part of the Order is found in temperate countries; in Europe, Siberia, China, and the temperate parts of North America, the species are exceedingly abundant, and have an aspect very different from that of the southern hemisphere. In the former we have various species of Pines, the Larch, the Cedar, Spruce, and Juniper; the place of which is supplied in the latter by Araucarias, Podocarps, Dammars, Eutassas and Dacryds. A *Callitris* (quadrivalvis) is found on Atlas, and a true *Araucaria* (*Bidwillii*) in New Holland. In New Zealand the Dacryds are sometimes no bigger than Mosses.

No Order can be named of more universal importance to mankind than this, whether we view it with reference to its timber or its secretions. Gigantic in size, rapid in growth, noble in aspect, robust in constitution, these trees form a considerable proportion of woods or plantations in cultivated countries, and of forests where nature remains in temperate countries in a savage state. Their timber, in commerce, is known under the names of Deal, Fir, Pine, and Cedar, and is principally the wood of the Spruce, the Larch, the Scotch Fir, the Weymouth Pine, and the Virginian Cedar: but others are of at least equal, if not greater value. *Pinus palustris* is the Virginian Pine, so largely employed in the navy for masts. The Stone Pine, and *Pinus halepensis* (*πενκη, Diosc.*) are extensively used by the Greeks in ship-building. The gates of Constantinople, famous for having stood from the time of Constantine to that of Pope Eugene IV., a period of 1100 years, were of Cypress. The wood of *Juniperus oxycedrus* is supposed to have been that from which the images of their gods were carved by the Greeks; and finally, the Deodar wood of India is all but imperishable. The Norfolk Island Pine is an immense tree, known to botanists as *Eutassa* (*Araucaria*) *excelsa*; the Huon Pine of Tasmania is *Microcachrys tetragona*; the Kawrie Tree of New Zealand, or *Dammara australis*, attains the height of 200 feet, and yields an invaluable light compact wood, free from knots, from which the finest masts in the navy are now prepared. But they are both surpassed by the stupendous Pines of north-west America, one of which, *P. Lambertiana*, is reported to attain the height of 230 feet, and the other, *Abies Douglasii*, to equal or even to exceed it. The latter is probably the most valuable of the whole for its timber. Their secretions consist of various kinds of resinous matter. Oil of turpentine, common and Burgundy pitch, are obtained from *Pinus sylvestris*; Hungarian balsam from *Pinus*

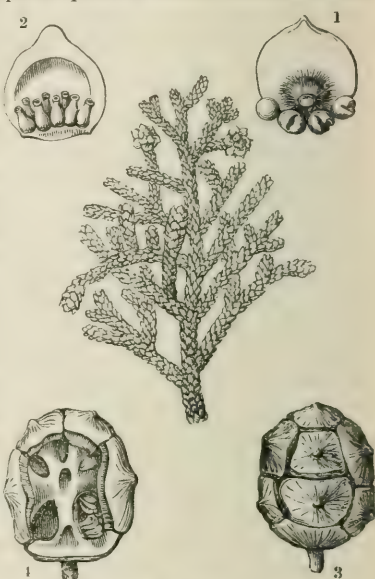


Fig. CLVII.

Fig. CLVI.—Pollen of, 1. *Juniperus virginiana*; 2. *Pinus sylvestris*.

Fig. CLVII.—*Cupressus sempervirens*; 1. a scale of a male cone with pollen; 2. a scale of a female cone with naked ovules; 3. a ripe cone; 4. the same with one of the scales removed.



Pimilio; a most fragrant resin from *Aranea Canadensis*, a hard brittle resin like copal from *Dammara australis*; Bourkany turpentine from *P. Unguifera*; Carpathian balsam from *P. Pinca*; Strasburg turpentine from *Abies picea* (P. *Picea*); Silver Fir; Canadian balsam from *Abies balsamea*, or the *Fir of Canada* (P.). The common Larch yields Venetian turpentine; a secretions matter called Manna of Juniper exudes from the branches, and when the Larch forests in Russia are cut a gum issues from the trees during their combustion, which is termed *gumme Onobolique*, and which is wholly soluble in water like gum arabic. Liquid turpentine is the same as he yielded by the Dammar Pine. Sassafras, a whitish yellow, brittle, moderately resinous substance, with an aerial aromatic taste, is said by Theophrastus to exude from *Juniperus communis*; but upon the authority of Dioscoridius and Scribonius it is the tears of *Callitris quadrivalvis*. I have seen a plant two feet tall of the Sassafras tree, which is called the Arar Tree in Barbary. The wood is considered by the Turkish destructive, and they use it for the ceilings and floors of their mosques. The balsam from which spruce beer is made is an extract of the branches of the *Abies canadensis*, the Henlock Spruce, and of *Abies nigra*. Great tanning powers exist in the bark of the Larch; as great, it is said, as in the Oak. The stimulating diuretic power of the seeds of *Juniperus Sabina*, are well known, and are partaken of in some degree by the common Juniper, the diuretic berries of which are an ingredient in *Uva Ursi* (L.); and by the *Thuja occidentalis*, and *Taxodium distichum*. Cypress was even once regarded as a febrifugal, and its oil as anthelmintic. The fetid oil of *Juniperus oxycedrus* is employed in veterinary practice. The large seeds of many are eatable. Those of the *Sacra* Pine of Europe, *Pinus Pinca* (the *πικρα*, *Diosc.*), *Cembra*, *Lambertiana*, *Llaveana*, and *Germanica*, and *Aranea imbricata*, are all eatable when fresh; and Mr. Edmull found the seeds of Mureton Bay feeding on the seeds of the *Aranea Bobathii* called *Harvey's* seeds.

GENERAL

Suborder I. ARISTEA.  
= *Arctostaphylos* L.; *pot-*  
*lunaria* L., *correa* L.

*Pinus, L. m.*

Abies, *Tournef.*

Print, Link.

*Loose, Journal.*  
*C. Lloyd Mall.*

Common loon, *R. id.**Belis*, Salisb.Arthrotaxis. *Id.*

*Microcachrys*, Hook, *fil.*

*Sciadopitys*, Zucc.

*Araucaria*, Juss.  
*Dacrydium*, Lam.

6. *gmel* = 1, 5 (dist)

Entana, N. 1954.

1. The first group of people who are interested in the study of the history of the United States are the people who are interested in the history of the United States.

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2016

[Suborder 11] C. 11.

$$S(\mathbf{v}_i) = \{v_i, v_{i+1}, \dots, v_n\}.$$
$$f = (n - 1)^{-1} \sum_{i=1}^n (x_i - \bar{x})^2 = 1.11.$$

*Juniperus, Linn.*

Thompson, Bruce  
 Thompson, Bruce

PLATE. *Figures 1-10.*  
*Fig. 1-10.*

*Platyclusus*, Spach.

Continued on p. 10

*Cryptosporidium parvum* O157.

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1. *Journal of the American Medical Association*, 1977; 237: 1000-1001.

References

Paradise, 1841

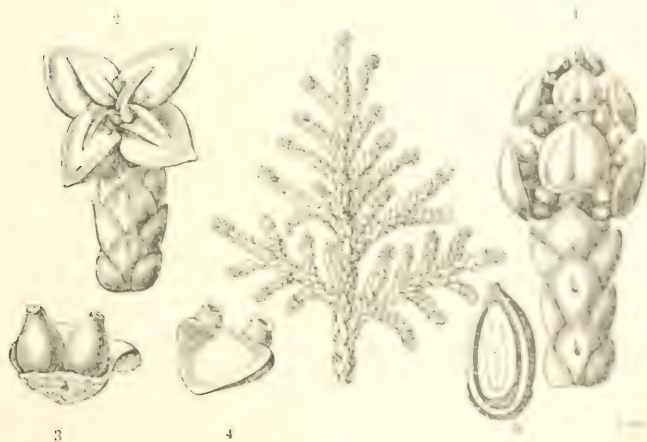
*Journal of Management Education* 31(10)

Figure 1. The effect of the concentration of the polymer on the  $\alpha$ -transition temperature of the polymer.

St. Anthony, Minn.  
Lutheran Hospital, St. Anthony, Minn.

NUMBERS. GEN. 20. Sp. 100.

Position, Cuyahoga Co. - PINNEY, S. LAKESIDE



17. CIVIL

Fig. CLVH.1.—*Thunnus orientalis*: 1, a young male specimen of approximately 10 cm TL; 2, a portion of a female branch; 3, 4, scales with naked eyes. Scale bar = 1.0 cm.



The genus *Saxe-Gothæa* forms a transition of the most remarkable kind from Conifers to Taxads. Sir William Hooker regarded it as a Podocarp with flowers in a cone. It is in reality a genus with the male flowers of a Podocarp, the females of a Dammar, the fruit of a Juniper, the seed of a Dacrydium, and the habit of a Yew.

The timber of the Zadd or Thêda of Abyssinia, *Juniperus procera*, one of the largest trees of that country, is hard, durable, and much employed in construction there. It is very nearly the same, if really different, as *Juniperus phœnicea*.—*Ach. Rich.*

That the plants of this order are sometimes poisonous, like Taxads, is now certain. Two children were poisoned a few years since at Chichester, from swallowing the leaves of what was called at the inquest Male Cypress, but which I ascertained, from evidence furnished by Mr. Buckell, to be *Cupressus Thyoides*.

#### ADDITIONAL GENERA.

*Pherosphæra*, *Archer.* near *Arthrotaxis*.  
*Widdringtonia*, *Endl.* near *Callitris*.  
*Frenela*, *Endl.* ditto.  
*Actinostrobus*, *Endl.* ditto.  
*Libocedrus*, *Endl.* near *Thuja*.

*Fitzroya*, *Hooker,* near *Thuja*.  
*Saxe-Gothæa*, *Lindl.* near *Juniperus*.  
*Glyptostrobus*, *Endl.* near *Taxodium*.  
*Sequoia*, *Endl.* ditto.

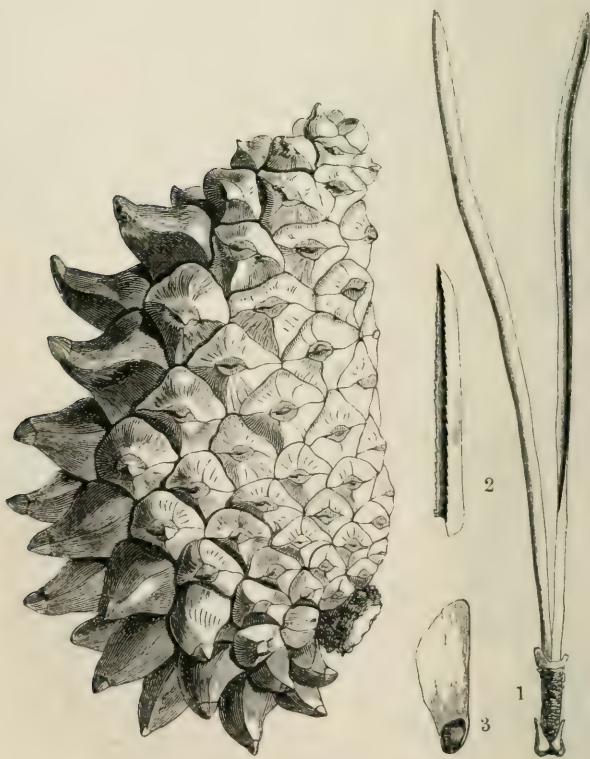


Fig. CLVIII. a.

Fig. CLVIII. a.—Cone of *Pinus muricata*, showing the difference between the outer and inner sides of the same strobilus when the inner side is pressed against a branch. 1. A pair of leaves; 2. the end of the leaf magnified; 3. a seed, natural size.





FIG. 17411

Fig. CLVIII. 1. *Pinus strobus*; 2. needle; 3. cross-section of needle; 4. ripe-gallotus.



## ORDER LXXV. TAXACEÆ.—TAXADS.

Taxineæ, *Rich. Conf.* 124. (1826); *Bartl. Ord. Nat.* 95. (1830); *Martius Conspectus*, No. 58. (1835); *Endl. Gen.* lxxviii.; *Meisner*, p. 353.—Taxaceæ, *Ed. pr.* (1836).

DIAGNOSIS.—*Gymnogens with repeatedly branched continuous stems, simple leaves often fork-veined, solitary females, 2-celled anthers opening longitudinally, and the membrane next the nucleus inclosed.*



Fig. CLIX.

Trees or shrubs with continuous, unarticulated branches. Wood having the ligneous tissue marked with circular disks. Leaves usually narrow, rigid, entire and veinless, evergreen, alternate or distichous; sometimes dilated and lobed, and in those cases having forked veins of equal thickness. Flowers ♂ ♀, naked, but surrounded by imbricated bracts. ♂ Stamens several; filaments usually monadelphous; anthers combined or distinct, opening longitudinally. ♀ solitary. Ovules naked, the foramen at their apex, their outer skin becoming finally hard. Seed usually supported or surrounded by a succulent imperfect cup-shaped pericarp. Albumen fleshy. Embryo straight, dicotyledonous, either antitropal or orthotropal.

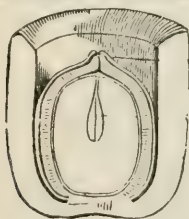


Fig. CLX.

Yews are separated from Conifers by their fruits not being collected in cones, each ovule growing singly, unprotected by hardened scales; so that this is a degree of organization yet lower than that of Conifers themselves. It is also to be observed, that in this Order the leaves do not always preserve the veinless needle-shaped state of Conifers, but expand and form veins, which are then forked and of uniform thickness, just as in Ferns. To me it appears that this deviation on the part of many genera from the Coniferous form of fruit, is a good practical distinction. Mr. Bennett, however, is of opinion that Taxads should not form a distinct Natural Order, but ought to be associated with Conifers; at least such I presume to be the bearing of his observations in Horsfield's *Plantæ Javanicæ*, p. 37. In the opinion of this excellent botanist, *Taxus* belongs to Cupressæ, while *Podocarpus* and *Dacrydium* should be associated with *Abietæ*, an opinion to which he seems to be led, in part at least, by considerations connected with the pollen of those plants. What these peculiarities of the pollen are, is explained at p. 228. But I see no reason why two kinds of pollen should not be comprehended under the Order of Taxads as well as under Conifers; and the importance of distinctions in the pollen of plants appears to me to be at least very doubtful.

Fig. CLIX.—*Taxus baccata* loaded with male flowers; 1. a male flower; 2. an anther; 3. a female flower; 4. a vertical section of an ovule; 5. of a ripe fruit; 6. of a ripe seed, showing the embryo.—N.B. 4. and 6. are the same part in youth and age; 5. is the ripe ovule, with an accessory cup

Fig. CLX.—Perpendicular section of the ripe fruit of *Taxus*, together with the cup-shaped pericarp, which rises round it after the pollen has taken effect upon the ovule.



These plants occur in the milder climates of a great part of the world, and spreading are found in elevated situations within the tropics. The common Yew is universally known in Europe; and it is common in the North of Asia. The genera *Podocarpus* and *Phyllocladus* are abundant in New Zealand. Of *Podocarpus*, the richest of any in species, three are found at the Cape of Good Hope.

Yews and their allies are resinous like Conifers, and often valuable for their timber, as evinced by the common Yew, which is unsurpassed for durability and elasticity. *Podocarpus cupressina* (Chomero) is one of the best timber trees of Java. The *Dacrydium taxifolium*, or Kakaterro of New Zealand, acquires a height of 200 feet. — *Ed. Ph. Japon.* 13. 373: its branches may be manufactured into a beverage resembling in antiscorbutic qualities the well-known spruce beer. *Podocarpus Totarra* furnishes the most valuable timber in New Zealand; and it is said that the possession of the trees has been the cause of wars among the savage natives. The leaves of the common Yew are fetid, very poisonous, especially to horses and cows. (Rex Cativulus Taxo, ejus magna in Gallia Germanique crypsos, se exanimavit. *Cæsar*.) The berries are not dangerous. The seeds are said to be mouth-burnsome. On the authority of an Italian physician it is stated that Yew leaves, when administered in small doses to man, have a power similar to that of *Digitalis* over the action of the heart and arteries, reducing the circulation, and if persisted in too long, are given in too large doses, as certainly fatal. Yew is, however, reported to have no decided advantage over *Digitalis*, by its effects not accumulating in the system, so that it is a much more manageable and more efficient remedy. — *Burnett*. The bark of *Phyllocladus trichomanoides* yields a red dye. The fruits of *Salisburia*, a tree of great beauty, now common in Europe, are about as large as Damsons, and both red and astringent; their kernels are thought by the Japanese to promote digestion. The nuts of *Caryocarpus* are very astringent, and are employed by the Japanese interpreters, "of over-curious urinam," when they are likely to be detained for a long time in the Imperial Council Chamber.



1

FIG. CLXI.

# GENERA.

*TAXUS*, L.

*Podocarpus*, L'Her.

*Dacrydium*, Sol.

*Torreya*, Arnott.

*Chamaecyparis*, Zucc.

*Nageia*, Guss.

*Phyllocladus*, L. C. Rich.

*Thurbergia*, Spreng.

*Isobetes*, L. C. Rich.

*Braconia*, L. C. Rich.

*Guinea-folia*, Spreng.

*Saccoloma*, Guss.

*Caracas*, Kuntz.

NUMBERS. GEN. 9. Sp. 595.

## *Phyllocladus*.

POSITION. GINETACEÆ.—TAXACEÆ.—DIOICO.

Fig. CLXI.—*Phyllocladus rhomboidalis*: 1. A single flower; 2. an entire branch, terminated in a pair of flowers.



## ORDER LXXVI. GNETACEÆ.—JOINT FIRS.

Gnetææ, Blume, in *Ann. Sc. 2. Ser. 2. 105.* (1834).—Gnetaceæ, Lindl. in *Bot. Reg.* 1686. (July, 1834); Endl. *Gen. lxxix.*; Meisner, p. 352.

DIAGNOSIS.—*Gymnogens* with repeatedly branched jointed stems, simple net-veined leaves, 1-celled anthers opening by pores, and the membrane next the nucleus protruded.

Small trees very much branched, or sarmentose shrubs, secreting watery, not resinous



Fig. CLXII.

1-leaved, transversely slit at the end, projecting from its bottom a monadelphous filament bearing 1-celled anthers, bursting longitudinally and centrally, so as to form a pore. Pollen (in *Gnetum*, simple, smooth, oblong, *Griffith*), in *Ephedra* ellipsoid, with 6 longitudinal furrows. ♀ altogether naked, or sheltered by a false calyx consisting of two scales, more or less combined, each of which surrounds one or two flowers. Ovary 0. Ovule pointed by a style-like process formed from a third membrane surrounding the nucleus. Seed drupaceous, before maturity pierced at the point and terminated by a style-shaped protruded process; finally pointless. Seed-coat thickish, either altogether leathery, or shelly, or fibrous internally, and succulent externally; in *Gnetum* lined by acicular woody tissue. Embryo dicotyledonous, in the middle of fleshy albumen; radicle superior.

Conifers and Cycads present features so peculiar that their separation from all other Orders is a point concerning which there can be no difference of opinion. It is indeed difficult to trace a plain transition from them to the other parts of the Vegetable Kingdom in which perfect sexes are present. There exist, however, a few plants, not very similar to each other in appearance, bearing the names *Gnetum* and *Ephedra*, in which we find precisely the structure and habit that would be wished for by a theorist searching for evidence to bring *Gymnogens* into communication with true *Exogens*; for one of them has all the appearance of a *Chloranth*, and the other of a *Casuarina*; and yet both retain the true peculiarities of *Gymnogens*. These are called *Gnetaceæ*, and may in English be termed *Joint Firs*, for they are closely allied to *Conifers*, but are distinctly known by their stems being jointed at every node. In these plants there is little tendency to form cones, and in the genus *Gnetum* the development of the ovule is so peculiar that botanists at one time, myself included, supposed that the real ovule was in truth an ovary pierced at the summit, for it consists of an exterior shell of considerable thickness and of a green colour; within which is a thinner envelope through which passes a tubular projection fringed at the point, and within these lies a nucleus, as is represented in the accompanying figure of the young ovule of *Gnetum Brunonianum*, copied from an unpublished drawing by Mr. Griffith. So that this sort of ovule has 3 distinct integuments, clear of the nucleus. It is to Mr. Griffith that I owe the knowledge of the true nature of these plants. In a most elaborate unpublished Memoir

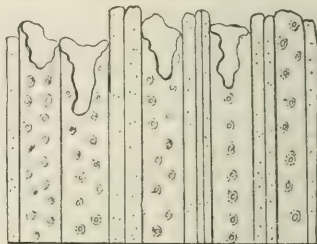


Fig. CLXIII.

matter, with opposite or clustered branches, and thickened separable articulations. Leaves opposite, entire, with anastomosing, reticulated veins; sometimes very minute and scale-shaped. Wood with the ligueous tissue marked with circular disks. Flowers ♂ ♀, arranged in catkins or heads, surrounded by opposite decussating scales which are connate at the base, or altogether consolidated into a horizontal ring. ♂ Calyx

Fig. CLXII.—*Gnetum Gnemon*: 1. a section of an ovule showing the three membranes, of which the innermost protrudes in the form of a stigma.

Fig. CLXIII.—A thin section of the wood of *Gnetum Gnemon*, highly magnified, after A. Brongniart



on the structure of *Gnetum*, he shows that in reality the whole of the ovum belongs to the ovulum. In that Memoir (dated Aug. 4, 1826), which unfortunately did not appear till after the publication of the last volume of this work, there is the following description of the development of the parts of this extraordinary organism:

"At a period long before the exertion of the anthers, the ovules, which become the male flowers, are generally of an oblong form, and consist of a rounded bell-shaped body, inclosed in two envelopes. The outermost of these is pluricellular and directed longitudinally on the upper face, or that nearest the axis; the former extending merely to the base of the ovule.\* The inner or second envelope is cellular, and is directed irregularly towards its apex.

"This envelope does not at this period entirely inclose the nucleus. The points or edges of the laminae or divisions project occasionally beyond the apex of the outer envelope.

The nucleus is an oval or oblong cellular body, rounded off at its apex, which is composed of hex cellular tissue.

"The next change consists in the commencement of the dilatation of the longitudinal fissure, existing along the posterior face of each outer envelope, and of an expansion of the inner coat over the nucleus, the apex of which becomes more or less depressed; the points of the depression, however, projecting in the form of a cone of a very slight elevation. At the time of flowering, or of the exertion and dehiscence of the anthers, the fissure originally existing along the upper face of the outer coat has disappeared; with the exception of a small portion at the apex of the axis, which remains uninclosed throughout. The ovules are at this period in some species oblique. The outer envelope is generally entirely inclosed within the outer; the points of its former coat, however, to the opening existing in the apex of this latter, and occasionally, but by no means universally, project beyond it to a short distance.

This coat has undergone scarcely any change, and corresponds in shape to the cavity of the outer envelope. The nucleus is completely covered by both integuments, and its apex, which continues of the same form, is occasionally tinged with brown. Within its substance, which is entirely cellular and towards its centre, there exists a small cavity lined with a membranous sac, attached apparently to the apex of the cavity, and containing a number of minute greenish-brown masses arranged without any definite number. This sac I consider to be the apophysis, with which it agrees in its development and subsequent disappearance; it exists at a rather early period, and is developed within a cavity formed by some excavating process.

"A short time after the fall of the male flower, an extraordinary change will be found to have occurred, consisting of the very rapid and apparently sudden development of a new membranaceous cellular envelope between the second coat and the nucleus. This new bounding, when I may use the

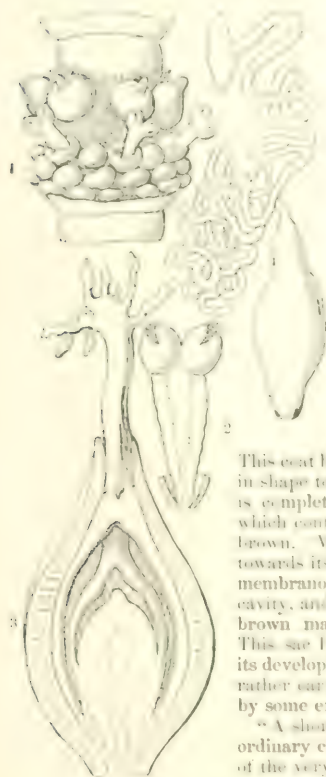


FIG. CLXIV.

the additional coat, envelopes the nucleus pretty closely, and is continued slightly beyond the apex of the nucleus into a cylindrical cellular process, the summit of which being lacinate or fimbriated. At the period now referred to, its apex being projects beyond the outer envelope. During its development no particular change has taken place either in the original integuments or nucleus. At a somewhat late period, the ovules, except in the instance quoted in the note, hitherto inclosed by the former, will be found exposed, and the outer coat to have become of a brown colour.

\* This division is perhaps similar to that which has been noticed by me in *Desmodium*.

† In one species, *G. Brongniartii*, the ovules are at an early period exposed, owing to the dehiscence of the annulate envelopes.

Fig. CLXIV.—Analysis of *Gnetum*, from a specimen by Mr. Kuntze. 1. A cluster of ovules. 2. A longitudinal section of an ovule, showing the internal structure. 3. A perpendicular section of an ovule, showing the internal structure. 4. A longitudinal section of an ovule, showing the internal structure.



The opening through its apex is distinct, and its direction vertical. The second envelope continues unchanged. The tubular prolongation of the additional or third envelope now projects through the openings in the original coats to a considerable distance. The mouth of the tube is also rather dilated, and the fringes of its margin spread out irregularly and to various extents. The whole of the tubular prolongation has become tinged with brown, in some cases approaching to black. It is to this stage or period that the descriptions of those authors who attribute a style and stigma to this genus apparently refer. Both Dr. Brown and Professor Lindley must likewise advert to this period when they state the nucleus to be surrounded with three envelopes."

There can be no doubt, then, that in reality *Gnetum* is as truly naked-seeded as Conifers themselves.

Independently of the singular organisation of its ovule, the genus *Gnetum* is remarkable for some other peculiarities. Its seed, which resembles a drupe, has within the outer fleshy integument, a layer of needle like woody tissue of a very remarkable nature, freely separating when disturbed, and looking much like the hairs of Cowhage. The embryo, according to Mr. Griffith, is attached to an "enormously long tortuous and spirally but irregularly twisted cellular funiculus, the cells of which are much elongated and twisted. Its length varies, when moderately pulled out, from  $3\frac{1}{2}$  to 5 inches, the whole length of the seed being about an inch. This funicle, as well as the extremely similar one of *Cycas*, has the property of contracting when immersed in water."—*MSS.* p. 15. Although belonging to the same category as Conifers and Taxads, the Joint Firs are very distinctly separated from them; for they have a calyx for the male flowers, and their anthers burst by pores, not longitudinally, to say nothing of the peculiarities of the ovule.

Natives of the temperate parts of Europe, Asia, and South America, and in the case of *Gnetum*, of the hottest parts of India and Guiana.

The interior of the pericarp of *Gnetum urens* is lined with stinging hairs; the seeds are eaten; the stem exudes a transparent gum, and when cut across yields an abundance of clear transparent tasteless water, which may be drunk.—*Aubl.* In Amboyna the seeds of *Gnetum Gnemon* are eaten roasted, boiled, or fried, and the green leaves form a favourite vegetable in lieu of Spinach; they are, however, very tasteless.—*Rumph.* The branches and flowers (*Amenta Uvæ maritimæ*, *Off.*) of the Asiatic *Ephedras* were formerly kept in the shops as styptics. The fruit is said to be mucilaginous, catable, sub-acid, and slightly pungent.

#### GENERA.

*Ephedra*, Linn.  
*Gnetum*, Linn.  
*Thoa*, Aubl.  
*Gnemon*, Rumph.  
*Uta*, Rheede.

NUMBERS. GEN. 2. Sp. 15.

*Chloranthaceæ.*

POSITION.—Pinaceæ.—GNETACEÆ.—Taxaceæ.

*Casuarinaceæ.*

N.B. C. A. Meyer enumerates 21 species of *Ephedra* alone. Endlicher makes out 7 species of *Gnetum*.



## CLASS VII. EXOGENS.

Dicotyledonous, *Juss. Gen.* 70. (1789). *DeC. Mon. Part. I.* 435. (1805). *Brickwood and Brownson, Rich. Arch.* 1808. *DeCandolle in L'Essence de l'Art de Planter* p. 226. *Art. 11.* *Phanerogames of Scandinavia*, 1808. *Arch.* 74. 1811. *Alph. Jour. de Bot.* 1811. *DeCandolle, in the Phil. Mag.* 1817. *Phanerogames of Scandinavia*, 1817. *DeCandolle, in the Phil. Mag.* 1817. *Phanerogames of Scandinavia*, 1817. *DeCandolle, in the Phil. Mag.* 1817. *Phanerogames of Scandinavia*, 1817.

By common consent the plants to which botanists formerly gave the name of Dicotyledons, and which now bear that of Exogens, are reckoned as the most completely formed of all the Vegetable Kingdom. In the more leaved or organised species they possess a degree of vitality unknown amongst Gymnogens. A century or two terminates the life of an Endogenous tree, unless in a few rare cases; while many Exogens may have been the monarchs of their forests even at the commencement of the Christian era. This arises from their peculiar manner of growth, which insures a renovation of their vigour with each succeeding year; and it is in allusion to this circumstance that their name has been contrived.

Exogens, or outward growers, are so called because, as long as they continue to grow they add new wood to the outside of that formed in the previous year; in which respect they differ essentially from Endogens, whose wood is constructed by successive augmentations from the inside. All the trees of cold climates, and the principal part of those in hot latitudes are exogenous. In an Exogen of ordinary structure the embryo consists of a cellular mass, in which there is usually no trace of woody or vascular tissue; but as soon as germination commences fine ligneous cords are seen proceeding from the cotyledons towards the radicle meeting in the centre of the embryo, and forming a thread-like axis for the root. As the parts grow the ligneous cords are increased in thickness and number, and having been introduced among the cellular mass of the embryo, are separated from each other by a portion of the cellular substance, which continues to augment both in length and breadth as the woody cords extend. By degrees the plumule or rudimentary stem becomes organised, and having begun a little, forms upon its surface one, two, or more true leaves, which gradually expand into thin plates of cellular substance traversed by ligneous veins or veins converging at the point of origin of the leaves. If at this time the interior of the young plant is again examined, it will be found that more ligneous cords have been added from the base of the new leaves down to the cotyledons, where they have formed a junction with the first cord, and have served to thicken the woody matter developed upon the first growth. These ligneous cords which proceed from the base of the leaves do not unite in the centre of the new stem, there forming a solid axis, but pass down parallel with the outside, and leave a small space of cellular tissue in the middle; they themselves being collected into a hollow cylinder, and not meeting in the middle until they reach that point where the woody cords of the cotyledons meet in order to form the solid centre of the root. Subsequently the stem goes on lengthening and forming new leaves. From each that was again traced a formation of woody matter disposed concentrically as before, and uniting with that previously formed: a cylinder of cellular substance being always left in the middle. The solid woody centre of the root proceeds in its growth in a corresponding ratio, lengthening as the stem lengthens, and increasing in diameter as the leaves unite and new woody matter is produced. The result of this is, that when the young Exogen has arrived at the end of its first year's growth it has a root with a solid woody axis.



and a stem with a hollow woody axis surrounding cellular tissue, the whole being covered in by a cellular integument. But as the woody cords are merely plunged into a cellular basis, the latter passes between them in a radiating manner, connecting the centre with the circumference by straight passages, often imperceptible to the naked eye, but always present. The annexed diagram illustrates this.



Here we have the origin of pith in the central cellular tissue of the stem, of wood in the woody axis, of bark in the cellular integument, and of medullary processes in the radiating passages of cellular tissue connecting the centre with the circumference.

The woody axis is not, however, quite homogeneous at this time. That part which is near the centre contains vessels of different kinds, particularly dotted vessels (bothrenchyma); the part next the circumference is usually destitute of vessels, and consists of woody tissue exclusively: of these two parts that with the vessels belongs to the wood, properly so called, and serves as a mould on which future wood is added; the other belongs to the bark, separates under the form of liber, and in like manner serves as a mould within which future liber is disposed.

At the commencement of a second year's growth the liber separates spontaneously from the true wood; a viscid substance called cambium is secreted between them; and the stem again lengthens, forming new leaves over its surface. The ligneous cords in the leaves are prolonged into the stem, passing down among the cambium, and adhering in part to the wood and in part to the liber of the previous year, the former again having vessels intermingled with them, the latter having none. The cellular tissue that connected the wood and liber is softened by the cambium, and grows between them horizontally while they grow perpendicularly, extending to make room for them, and consequently interposed between the woody cords of which they each consist, forming in fact a new set of medullary processes terminating on the one hand in those of the first year's wood, and on the other in those of the first year's liber. This addition of new matter takes place equally in the stem and in the root, the latter extending and dividing at its points, and receiving the ends of the woody cords as they diverge from the main body. The following figure illustrates this, and shows, when compared with the last, what difference there is in the appearance of the stem of an Exogen one and several years old.

And thus, year after year, the Exogen goes on, forming zone upon zone of wood, which is permanent, and zone within zone of bark which perishes at the outside, but is renovated at the inside, as the stem increases in diameter.

If this account is compared with what has already been stated concerning Endogens, it must be obvious that the stem of these two great classes is formed from the very beginning in an essentially different manner. Endogens have no cylindrical column of pith; their woody arcs are never collected into a cylinder, through the sides of which the cellular tissue passes



Fig. CLXV.—Ideal section of the root and stem of an Exogen one year old.  
Fig. CLXVI.—Real section of the stem of an Exogen six years old.



in the form of medullary processes; and the woody matter of their bark, so to call their cortical integument, is not parallel with that of the wood and spontaneously separable from it. The only way in which the growth of the stem of Exogens corresponds with that of Endogens is that in both classes the woody matter is connected with the leaves; and in both a solid central axis is the foundation of the whole structure. Nevertheless, attempts have been made by some modern physiologists to identify the two, and to show that the one is very little different from the other.

It is not, however, to be supposed that the manner of growth in Exogens is in all cases exactly what has been thus described as its normal condition. On the contrary, a great variety of modifications has been found to exist, dependent in part upon an excessive development of cellular matter, and in part upon the formation of angles, lobes, or summities, upon the loss of concentric rings of wood for which a great homogeneity of structure is substituted, and upon the production of irregular zones of cellular matter resembling bark, between the zones of wood. Cases of this kind have attracted the attention of most modern botanists. Several have been noticed in our Introduction to Botany, in the *Penny Cyclopædia*, art. LAURACEÆ, and by Decaisne, Adrien de Jussieu, Schultz, Gaudichaud and Schleiden; but they have not been applied successfully to systematical purposes. As a sketch of a possible plan of extending the classes of plants at the expense of Endogens (*Bot. Rev.* 1839), *Misc.* p. 76, I have suggested the formation of a group to be called Homogens, to which it has been proposed to unite *Dryopteris*, *Nepenthes*, *Lardizabalads*, *Menisperms*, *Peppers*, and several other Orders. The character upon which reliance was placed was the remarkable manner of the wood of these plants, which never have more than one ring of woody matter, to whatever age they may have arrived. M. Decaisne has however shown (*Mémoire sur les Lardizabalees*), that although this peculiarity is extremely striking in some cases, as for example, in *Ardischia liliacea*, yet that it is not constant in even the same Order, *A. clematitis* having several zones; and that in *Menisperms*, while there is a great departure from the ordinary structure of Exogens, except *Aristolochia* so far as regards the liber, the wood is regularly zoned in many instances, although the dotted vessels are wanting.

Nevertheless, although from the very imperfect state of information concerning the true structure of the stems of plants, I am unable to offer, by retaining this division, such reasons as would be satisfactory, yet I think it will be recognised hereafter, either wholly or in part; at least I am persuaded that the time will come when the internal structure of the stem will be far more extensively consulted than it now is, and be made the basis of good and important systematic divisions. Schultz preceded me in this attempt, in preparing his *Synonymia diichogamitiden* (*Naturalthes System der Pflanzenwelt*, p. 319, 1832), to which he referred *Piperaceæ*, *Sauritaceæ*, *Chamaecitaceæ*, *Nyctaginaceæ*, *Callitricaceæ*, *Hippuridaceæ*, *Myrtophylloideæ*, *Amaranthaceæ*, *Cycadeaceæ*, *Nymphaeaceæ*, *Nelumbaceæ*, and *Diphyllaceæ*; and his proposition, like mine, has fallen to the ground. But although the groups he collects under *Diphyllaceæ*, namely, *Diphyllaceæ*, *Protophyllaceæ*, and others, are in no wise different from the ordinary state of *Endogens* Exogens, yet it must be admitted that *Hippocids* and several of the others offer less resemblance to that plan of organisation. It is difficult to say whether Schleiden contemplates the possibility of any similar system; but it is worthy of notice that he, in his paper *On the Anatomical and Physiological Differences in the Structure of Stems*, translated in the *Annals of Botany* (iv. 249)



collects Peppers, Nyctaginaceæ, Amaranths, and Chenopods, by the common character of their stems having several sets of fibrovascular bundles, as in Endogens. It is however evident, as is stated in the proper places of this work, that the character proposed by Schleiden is no more universal than that which has been mentioned by myself; and therefore I think it more prudent to defer for the present an attempt at maintaining the Class of Homogens, and to leave it to be determined by future and very extended inquiries, whether such a group really exists in nature, what are its limits, and how they are to be defined. It seems probable that some such a group does exist, or at least that in the stems of Dicotyledonous plants there are modifications of structure of the very highest importance, to which attention has been hitherto insufficiently directed.

If Exogens are distinctly known from Endogens by their peculiar manner of growth and by the arrangement of their woody matter, they are not less clearly defined by external marks.

Their leaves have the veins ramifying from the midrib, or ribs if there are several, in so intricate a manner as to give the appearance of irregular network. Their veins never run parallel with each other without ramifications; for if, as sometimes happens, they appear to do so, it will be found that the appearance is confined to the principal veins or ribs, and that the secondary veins between them ramify in the usual way. The leaves are moreover in most cases articulated with the stem, leaving behind them a clean scar when they die, not rotting away and hanging upon the stem in the form of a ragged sheath, as is common in Endogens. Moreover, they are frequently furnished with stipules, an unusual circumstance in Endogens.

The flowers of Exogens are usually constructed upon a quinary type, that is to say, have five sepals, five petals, and five stamens, or some power of that number; now and then they vary to a type of four, or they exceed the number five; but we rarely find the ternary structure of Endogens present in them. If, as in Crowfoots, Berberids, Anonads, and other Orders, the sepals and petals follow a ternary type, the number three is lost in the stamens or the ovary. The Natural Order of Menispermads is the only one among Exogens in which the ternary type regularly pervades all the parts of the flower.

In their manner of growth they rarely resemble Endogens. The consequence of the ramification of the veins is to give their leaves a broad and rounded figure, the effect of which upon their general appearance is to produce the round-headed aspect that we recognise in all the trees naturally inhabiting this country. In no known instance does the stem grow by the development of a single terminal bud; so that we never find in this class the columnar aspect of Palm-trees, unless the genus *Theophrasta* be considered an exception.

The differences between Exogens and Endogens, thus strongly marked in the stem, leaves, and flowers, are connected with others in the embryo. In Exogens of the common kind this organ has two lobes, held together by a minute central body, the upper end of which, between the lobes, is the plumule or rudimentary stem, the lower the radicle or rudimentary root; the lobes themselves, or cotyledons, are rudimentary leaves. This structure is readily seen in a hazel-nut or a garden-bean; the deviations from it are few and unimportant as compared with those of Endogens. Three or a greater number of cotyledons may be present in a whorl, instead of two opposite to each other. Or one of the two cotyledons may be much smaller than the other, as in *Trapa*; or they may be deeply lobed, as in the garden-



cross. But in all these cases the deviation is not sufficiently pronounced to make the typical character of being dicotyledonous.

When the embryo of an Exogen germinates, the radicle simply disappears at its point, without having to break through the coat of the embryo — on this account Exogens have been named exorhizal.

Hence the class of Exogens has five important, and, in some instances, independent characters, by which its limits are settled.

1. The wood is exogenous.
2. The veins of the leaves are netted.
3. The fructification is formed upon a quinary or quaternary type.
4. The embryo is dicotyledonous.
5. The germination is exorhizal.

Exogens have received other appellations in allusion to such characters; they are commonly called Dicotyledones, and Exorhizæ is another, but less common appellation; moreover, they are the Phanerocotyledonæ of Agardh, the Anthophytæ and Carpophytæ of Oken's school, the Dicotyledonæ of Schultz, the Phylloblastæ of Reichenbach; not to mention names still more obscure.

In consequence of imperfect development, and the abortion or multiplication of parts, many deviations occur from the above characters. But as in Endogens, so in these, such anomalies do not create any real difficulty in distinguishing Exogens from other plants. Suppose the stem to be not slightly formed, as in Mossweeds (Podostemaceæ), or the aquatic *Hypnoidæ*, as not to arrive at a state in which the exogenous arrangement is perceptible, we have the dicotyledonous embryo, and the typical number of floral organs to guide us. Let the leaves appear as scales, as in *Lathraea*, *Orobanche*, and the like; still there is the embryo or again the floral proportions. If the fructification is absolutely ternary as in *Menispermata*, the organisation of the stem, leaves, and embryo reveals the true nature of such plants. Or if the embryo is undivided, as in *Cuscuta*, and at the same time the veins of the leaves deficient, and all this with an incomplete formation of woody matter, then the number of parts in the flower remains to prevent our falling into error. It is therefore always to be remembered, that the limits of this great class are not exclusively determined by one single character, but by a combination of five; a part of which may be occasionally exceptional or undiscoverable.

But while the class of Exogens is thus distinctly circumscribed, it is found to approach the limits of other classes at various points. It evidently touches Gymnogens by means of Beefwoods (*Amaranthaceæ*). Endogens are represented by Crowfoots, some of the species of *Hemianthus* having a striking resemblance to Alismads, and perhaps by Peppews, which seem to have a tendency to Arads. *Menispermata* may almost be mistaken for Sarsaparillas (*Smilacæ*), and thus a connection is established with Dicotyogens; Mossweeds (*Podostemaceæ*) may be regarded as analogous to Liverworts among Thallogens; it is not unreasonable to regard *Hypnoidæ* as an exogenous form of Arrowgrasses, or *Callitriche* as the analogue of *Lemna*, and the whole Nymphet Allied certainly seems very near to Hydrocharads.

The different methods of classifying Exogens have been considered in the introductory part of this work. That which is here adopted is founded on the following considerations.

The office of reproduction is, after that of sustaining life, the most essential in the economy of both plants and animals, and therefore the



modifications which are found in the organs of reproduction may be expected to furnish the best characters for classification, after those of nutrition. The latter have been already employed as the foundations of the classes, as far as they appear susceptible of being so applied; the former, consisting of the stamens and pistil, have been little used for the classes, and appear to present as many modifications as are required for secondary divisions. That was the opinion of Linnæus, who adopted them in the construction of the Classes and Orders of his sexual system; but he mainly relied upon their number, which is a circumstance of little or no importance, and where that was done his classification proved useless; but in those parts of the system in which he made use of other circumstances, as in his Monadelphia, Diadelphia, Tetradynamia, Didynamia, Syngenesia, &c., his divisions ceased wholly or in part to be artificial, and although in some instances modified, still correspond essentially with the Natural Orders of modern botanists.

Nor did the importance of the stamens and pistil escape the keen eye of Jussieu, who relied upon them very much in the construction of his ingenious system. In the first place, he separated from all other Exogens those which have the stamens in one flower and the pistil in another, and he called them Diclinous, and by this process he brought together a collection of Natural Orders, corresponding with the Monœcious and Dioecious plants of Linnæus. No one can doubt that this was a judicious step, and upon the whole the plants collected in the diclinous division resemble each other more than they resemble anything else; but he excluded a large number of truly diclinous plants, which are scattered over other parts of his classification, and this has led to the idea that the distinction itself was a bad one, an opinion in which I formerly concurred; but a more careful examination of it since, and an extended acquaintance with the Vegetable Kingdom, has entirely convinced me that we have no available characters for breaking up Exogens into primary groups or sub-classes superior to those of separated and united sexes, that is, to diclinism and hermaphroditism. Not that they are without exceptions; to employ the forcible language of Jussieu himself: "*Ut in præcedenti serie nonnullas diclinis hermaphroditis commixtas plantis admittit exceptio, sic in diclinium ordines quedam irreput hermaphroditæ, consentiente aut jubente naturâ quæ stabiliores interdum eludit regulas, nonnunquam instabilis ipsa aut abstrusis legibus obtemperans.*"—*Gen. Pl.* 384. But if what are called polygamous plants, that is to say, such as have a rudimentary pistil in the male flowers, and rudimentary stamens in the female flowers, are regarded as being hermaphrodite, as they surely are, and the idea of a diclinous structure is limited to cases of a total separation of the stamens and pistil, these exceptions are reduced to a small and unimportant number, of no moment in a classification. For this reason, then, the diclinous subclass of Jussieu is still preserved; increased by modern discoveries and improved by the expulsion of such plants as Piper, Gnetum, Ulmus, and others which belong to hermaphrodite Orders, or have other affinities than those suggested by Jussieu.

In this way Exogens are broken up into 2 groups, the one Diclinous and the other Hermaphrodite. The latter is divided by almost everybody into Polypetalous, Monopetalous, and Apetalous sub-classes; following the old systematists, who knew of little beyond external characters, and had small acquaintance with any plants except those of Europe. But all experience shows, what reason seems to indicate, that no great natural



combinations can be effected by such distinctions. Extraneous to the constancy of such characters are endless; there is probably but one polypetalous Order that is not also apetalous, and many of these are even monopetalous, of which Rueworts, Heescherkes, Aminals, Leguminous plants, Milkworts, and many more, afford familiar examples. The apetalous Orders are occasionally polypetalous, as in many genera of Huckleberries and Dogwoods. The monopetalous structure becomes polypetalous in all but a very few cases, even indeed in such natural Orders as the Primroses; and it even disappears altogether, as in Oliveworts and Primworts. Nor is it probable that characters derived from the calyx and corolla should be of the very highest value, for, in the first place, those organs are physiologically identical, their distinction having no real existence except in certain special instances; and, in the next place, the importance of them to the act of reproduction can hardly be considerable, when we find that plants are multiplied quite as well in their absence as in their presence, and even that, as in the Violet, some Leguminous plants, the common Apple, &c., which habitually produce them, seeds are matured as freely when they are partially away as when in a state of high development. For this reason, the calyx and corolla are here rejected as organs suited for distinguishing the primary groups, or the Sub-classes, of Exogens.

We are not, however, justified in assuming that the calyx and corolla are never of any high importance in plants; and, therefore, while they are objectionable as forming the basis of a classification *per se*, they are recognised as having a real value in connection with the stamens. If the stamens have no adhesion to either calyx or corolla, then it may be assumed that the latter organs may be dispensed with; and for this reason the first Sub-class of hermaphrodite Exogens is characterised by the stamens standing entirely clear of the floral envelopes, or being, in the language of *Linnaeus*, Hypogynous. But if there is any adhesion between the stamens and either the calyx or corolla, it may equally be assumed that the one organ is in some way necessary to the other: for this reason the Perigynous character is admitted as a valid mark of a Sub-class; not, however, a slight and inappreciable adhesion, but a real and manifest union of the parts; and it is considered immaterial whether the stamens grow on the petals or the calyx, provided they grow on one of them.

Beyond this we have that further degree of adhesion, to which *Linnaeus* gave the name of Epigynous: consisting of a union not only of the calyx or corolla to the stamens, but of all those organs to the sides of the ovary. This, in which it may be supposed that a higher degree of intimacy for the incorporation of the floral organs exists than in the former case, is taken to be the distinctive mark of a third Sub-class of hermaphrodite Exogens. So that the Sub-classes are established on the following grounds:

<i>Flowers absolutely unisexual.</i>	I. DIOECIOUS.
<i>Flowers hermaphrodite.</i>	
<i>Stamens not adhering to either calyx or corolla.</i>	II. HYPOGYNOUS.
<i>Stamens adhering to either calyx or corolla.</i>	III. PERIGYNOUS.
<i>Stamens, calyx, and corolla all adhering to the sides of the ovary.</i>	IV. EPIGYNOUS.

This, it may be said, is essentially the old plan of *Linnaeus*; but there is this material difference between the method now proposed and that of the great chief of the French school: that what he treated as a secondary character is made primary; while his primary distinction of polypetalous



monopetalous, and apetalous structure, is treated quite as a subordinate consideration, as it surely deserves to be.

If the classification thus obtained be attentively studied, it will be found to offer many entirely new combinations, while others of universally recognised truth are not disturbed by it. Of these new combinations there are few to which any serious objection seems to apply, and it is believed that the larger part of them are more opposed to our prejudices than to truth. Not that I have the presumption to suppose that they will meet the universal approval of Botanists. What method of classification ever has or ever can? So long as there are many points of view from which a survey may be taken of the Vegetable Kingdom, so long will there be conflicting opinions as to the way in which the objects that meet the eye can best be grouped.

In former attempts at redistributing the natural Orders of Exogens, I had proposed to throw into one Sub-class all those in which the embryo is very small as compared with the albumen in which it is imbedded; and I still think that this peculiarity is of as much importance among plants as the being oviparous or viviparous among animals. But, although I do not at present see a reason for retracting my former opinion upon that subject, yet I do see that the time is hardly come for carrying out such a principle satisfactorily. And, therefore, instead of employing it for the character of a Sub-class, it has only been used as a means of limiting Alliances.

Although, from the complicated nature of the affinities of plants, no hope can be reasonably entertained of securing an unbroken line of transition from one end to the other of the series in which the various groups must necessarily be treated of, yet it will be found that the method here proposed offers very few considerable gaps in the chain of relationship. Commencing with the Amental Alliance, which seems to stand in near relation to the Joint-firs (*Gnetaceæ*) among Gymnosperms, the passage to the Urtical and Euphorbial is too plain to require explanation: of the latter the Quernal and Garryal may be regarded as epigynous forms,—the first without albumen, the second with an abundance of it. Nutmegs, in the Menispermatal Alliance, then fit in; and the twining Menispermads may be taken as an anticipation of Cucurbitals, of which the Papayal Alliance is an offset, a little out of the direct line of succession.—Even to the latter, however, an analogue is found among Violals, in the form of Bixads and Samyds; thence Turnerads conduct us directly into the Cistal Alliance. At this point we quit the debateable ground of affinities, and, passing successively through Malvals, Sapindals, Guttiferals, we reach the Nymphal Alliance through Tutsans. Here, however, the chain is evidently broken, and probably the sequence is wrong. The Water-shields (*Cabombaceæ*), among Nymphals, pass directly into the Ranal Alliance by way of the Crowfoots, whence Poppyworts join Fumeworts in the Berberal Alliance. At this place Cyrillads appear to form a connecting link with Humiriads among Ericals, and the latter pass directly into the Rutal Alliance by the intervention of such plants as *Correa*. From Rutals the passage is easy to the Geranial, Silenal, and Chenopodal Alliances, which suddenly stop with the Peppers; this is, however, a doubtful case of affinity, although such a plant as *Batis* may seem to justify the approximation. At the point now reached the Perigynous Sub-class is penetrated by way of the Ficoidal Alliance, which might be almost united with the Chenopodal. Scleranthals, among Ficoidals, seem to present a transition to Salvadorads in the Daphnal Alliance, of which again a part of the Rosal Alliance is almost a polypetalous form. . From



Rosals to Saxifragals, and then by way of Drosera to Rhinanthals, of the same step. At this point the Gentianal Alliance is entered by way of Belladonnals, and we quit it by moving from Gentianaceae into the Solanaceal Alliance. The Cortusals, Echials, and Bignonial Alliances may be passed without an obstacle; and thus we reach the end of the Perigrinuous Sub-class, and the networks, in the Bignonial Alliance, fit on to Gelsemium among the Cactaceals of the Epigynous Sub-class; these pass Myrsinals, through Myrsinaceae on the one hand, and Napoleoneae on the other. From Myrsinals we quit to the Cactal Alliance, which may be theoretically considered a passing condition of the former, so near do the Oncagrells of the former approach the Leosals of the latter group. This brings us to Darringtoniads and other Orders collected in the Grossal Alliance. The Clusaceals are entered by way of Bilberryworts, and quitted through the Stellate plants, which gradually touch Umbellifers in the Umbellal Alliance. At this point a passage is effected into the last Alliance, that of Asurals, by way of Witch-hamels and Sandalworts, till the whole line is finally closed by the Birdworts. These singular plants, with their ternary flowers, appear to have an incontestable relationship to Yams among Dictyogens, and thus the circle of affinities eventually returns into itself.

Each of the Sub-classes consists of Alliances which have also in many instances a strong lateral relation; so that in order to obtain a clear view of their mutual correspondence it is necessary to place them side by side as well as in succession. This is very obvious in the following instances:—

<i>Diclinous.</i>	<i>Hypogynous.</i>	<i>Perigynous.</i>	<i>Epigynous.</i>
Urticales, . . . .	Chenopodiales, . . . .	Parvales, . . . .	Myrsinales
Euphorbiales, . . . .	Malvales, . . . .	Daphniales, . . . .	Myrsinales
Menispermiales, . . . .	Ranales, . . . .	Saxifragales, . . . .	Myrsinales
Cucurbitales, . . . .	Violales, . . . .	Bignoniales, . . . .	Cucurbitales
		(Celastrales)	

This abundantly shows how hopeless it is to express the real affinities of plants by any other means than a map, or some such contrivance; and that all sequences will of necessity be inadequate to explain in any considerable degree the position in which natural Orders really stand with relation to each other.

## ALLIANCES OF EXOGENS.

### SUB-CLASS I. DICLININOUS EXOGENS.

Flowers ♂ ♀, without any customary tendency to ♂.

- AMENTALES. — *Flowers in catkins, subterminal or terminal; carpels superior; embryo small, with little or no albumen.*
- URTICALES. — *Flowers scattered, monothalamous; carpels lower, inferior; embryo large, lying in a small quantity of albumen.*
- EUPHORBIALES. — *Flowers scattered, monothalamous; carpels sessile, dated, superior; placenta axillary; embryo surrounded by abundant albumen. (Alliance sometimes shared.)*
- QUERNALES. — *Flowers in catkins, monothalamous; carpels inferior; embryo amylolaboid, without albumen.*
- GARRYALES. — *Flowers monothalamous, sometimes monothalamous; carpels inferior; embryo minute, in a large quantity of albumen.*



- MENISPERMALES.**—*Flowers monodichlamydeous ; carpels superior, disunited ; embryo surrounded by abundant albumen.*
- CUCURBITALES.**—*Flowers monodichlamydeous ; carpels inferior ; placenta parietal ; embryo without albumen.*
- PAPAYALES.**—*Flowers dichlamydeous ; carpels superior, consolidated ; placenta parietal ; embryo surrounded by abundant albumen.*

## SUB-CLASS II. HYPOGYNOUS EXOGENS.

Flowers ♂, or ♂ ♀ ♀ ; stamens entirely free from the calyx and corolla.

- VIOLALES.**—*Flowers monodichlamydeous ; placenta parietal or sutural ; embryo straight, with little or no albumen.*
- CISTALES.**—*Flowers monodichlamydeous ; placenta parietal or sutural ; embryo curved or spiral, with little or no albumen.*
- MALVALES.**—*Flowers monodichlamydeous ; placenta axile ; calyx valvate in æstivation ; corolla imbricated or twisted ; stamens definite or 00 ; embryo with little or no albumen.*
- SAPINDALES.**—*Flowers monodichlamydeous, unsymmetrical ; placenta axile ; calyx and corolla imbricated ; stamens definite ; embryo with little or no albumen. (Stamens rarely 00.)*
- GUTTIFERALES.**—*Flowers monodichlamydeous ; placenta axile ; calyx imbricated ; corolla imbricated or twisted ; stamens 00 ; embryo with little or no albumen. (Stamens sometimes definite in number.)*
- NYMPHALES.**—*Flowers dichlamydeous ; placenta axile or sutural ; stamens 00 ; embryo on the outside of a very large quantity of mealy albumen. (A part have no albumen.)*
- RANALES.**—*Flowers monodichlamydeous ; placenta parietal, sutural or axile ; stamens 00 ; embryo minute, inclosed in a large quantity of fleshy or horny albumen.*
- BERBERALES.**—*Flowers monodichlamydeous, unsymmetrical in the ovary ; placenta sutural, parietal, or axile ; stamens definite ; embryo inclosed in a large quantity of fleshy albumen.*
- ERICALES.**—*Flowers dichlamydeous, symmetrical in the ovary ; placenta axile ; stamens definite ; embryo inclosed in a large quantity of fleshy albumen. (Stamens occasionally adherent to the corolla.)*
- RUTALES.**—*Flowers monodichlamydeous, symmetrical ; placenta axile ; calyx and corolla imbricated, if present ; stamens definite ; embryo with little or no albumen. (Occasionally ♂ ♀.)*
- GERANIALES.**—*Flowers monodichlamydeous, symmetrical ; placenta axile ; calyx imbricated ; corolla twisted ; stamens definite ; embryo with little or no albumen.*
- SILENALES.**—*Flowers monodichlamydeous ; placenta free, central ; embryo external, curved round a little mealy albumen ; carpels more than one, completely combined into a compound fruit. (Some slightly perigynous, others ♂ ♀.)*



- CHENOPODALES.** — *Flowers monochlamydeous; placentæ central; embryo external, either curved round or appressed to the surface of a little mass of fleshy albumen; perianth solitary, or, if more than one, distant. (Some distant perigynous, others ♂ & ♀.)*
- PIPERALES.** — *Flowers achlamydeous; embryo minute, or with scarcely a large quantity of fleshy albumen. (Commonly ♂ & ♀.)*

### SUB-CLASS III. PERIGYNOUS EXOGENS.

*Flowers ♂, or ♂ & ♀; stamens growing to the side of either the calyx or corolla; ovary superior, or nearly so.*

- FICOIDALES.** — *Flowers monodichlamydeous; placentæ central or axile, corolla, if present, polypetalous; embryo external, curved round a small quantity of fleshy albumen.*
- DAPHNALES.** — *Flowers monochlamydeous; carpel solitary; ovary amygdaloid, without albumen.*
- ROSALES.** — *Flowers monodichlamydeous; carpels more or less distinct; placentæ sutural; seeds definite; corolla, if present, polypetalous; embryo amphitrich, with little or no albumen.*
- SAXIFRAGALES.** — *Flowers monodichlamydeous; carpels monothalid; placentæ sutural or axile; seeds (6); corolla, if present, polypetalous; embryo taper, with a long radicle, and a little or no albumen.*
- RHAMNALES.** — *Flowers monodichlamydeous; carpels monothalid; placentæ axile; fruit capsular, baccate, or dehiscent; seeds definite; embryo amphitrich, with little or no albumen.*
- GENTIANALES.** — *Flowers dichlamydeous, monopetalous; placentæ axile or parietal; embryo minute, or with the rudiments of a small quantity of albumen, lying in a large quantity of albumen.*
- SOLANALES.** — *Flowers dichlamydeous, monopetalous, symmetrical; placentæ axile; fruit 2-lobed; embryo large, lying in a small quantity of albumen. (Occasionally monodichlamydeous or polypetalous.)*
- CORTUSALES.** — *Flowers dichlamydeous, monopetalous, symmetrical; placentæ free, central; embryo large, lying in a small quantity of albumen. (Occasionally monodichlamydeous or polypetalous.)*
- ECHIALES.** — *Flowers dichlamydeous, monopetalous, symmetrical or unsymmetrical; fruit baccate or capsular, consisting of several one-seeded nuts, or of almost of that quantity or separately; embryo large, with little or no albumen. (Very rarely hypogynous.)*
- BIGNONIALES.** — *Flowers dichlamydeous, monopetalous, unsymmetrical; fruit capsular or baccate, with its seeds generally divided; placentæ axile, or parietal, or free central; embryo with little or no albumen.*



## SUB-CLASS IV. EPIGYNOUS EXOGENS.

Flowers ♂ or ♂ ♀ ♀; stamens growing to the side of either the calyx or corolla; ovary inferior or nearly so.

CAMPANALES. — *Flowers dichlamydeous, monopetalous; embryo with little or no albumen.*

MYRTALES. — *Flowers dichlamydeous, polypetalous; placenta axile; embryo with little or no albumen. (Occasionally monochlamydeous.)*

CACTALES. — *Flowers dichlamydeous, polypetalous; placenta parietal; embryo with little or no albumen.*

GROSSALES. — *Flowers dichlamydeous, polypetalous; seeds numerous, minute; embryo small, lying in a large quantity of albumen.*

CINCHONALES. — *Flowers dichlamydeous, monopetalous; embryo minute, lying in a large quantity of albumen.*

UMBELLALES. — *Flowers dichlamydeous, polypetalous; seeds solitary, large; embryo small, lying in a large quantity of albumen.*

ASARALES. — *Flowers monochlamydeous; embryo small, lying in a large quantity of albumen.*

\*.\* The following artificial arrangement of the Alliances of Exogens will render it more easy to compare their characters.

## Sub-class I.—DICLINOUS EXOGENS.

## a. Albumen abundant.

- Ovary inferior . . . GARRYALES.
- Ovary superior . . . MENISPERMALES.
- Carpels several, disunited.
- Carpels consolidated.
- Placenta axile . . . EUPHORBIALES.
- Placenta parietal . . . PAPAYALES.

## b. Albumen wanting, or in moderate quantity.

- Ovary inferior.
- Placenta axile . . . QUERNALES.
- Placenta parietal . . . CUCURBITALES.
- Ovary superior.
- Flowers amentaceous . . . AMENTALES.
- Flowers not amentaceous . . . URTICALES.

## Sub-class II.—HYPOGYNOUS EXOGENS.

## a. Albumen abundant.

- Flowers achlamydeous . . . PIPERALES.
- Flowers monodichlamydeous.
- Embryo external . . . NYMPHALES.
- Embryo internal.
- Stamens 00 . . . RANALES.
- Stamens definite.

Flowers unsymmetrical in the ovary . . . BERBERALES.

Flowers symmetrical in the ovary . . . ERICALES.

## b. Albumen wanting, or in small quantity.

- Embryo external.
- Carpels solitary, or distinct . . . CHENOPODALES.
- Carpels consolidated . . . SILENALES.
- Embryo internal.

Placenta axile or central.

Flowers unsymmetrical . . . SAPINDALES.

Flowers symmetrical.

Calyx valvate . . . MALVALES.

Calyx imbricated . . . GUTTIFERALES.

Stamens 00 . . .

Stamens definite.

Corolla twisted . . . GERANIALES.

Corolla imbricated . . . RUTALES.

Placenta parietal or sutural.

Embryo curved or spiral . . . CISTALES.

Embryo straight . . . VIOLALES.

## Sub-class III.—PERIGYNOUS EXOGENS.

## a. Albumen abundant.

- Placenta free, central . . . CORTUSALES.
- Placenta axile or parietal . . . GENTIANALES.

## b. Albumen wanting, or in small quantity.

- Embryo external . . . FICOIDALES.
- Embryo internal.

Flowers unsymmetrical.

Fruit capsular or baccate . . . BIGNONIALES.

Fruit nucamentaceous . . . ECHIALES.

Flowers symmetrical.

Monochlamydeous.

Carpels solitary . . . DAPHNALES.

Carpels consolidated . . . RHAMNALES.

Dichlamydeous.

Polypetalous.

Carpels consolidated. Seeds definite . . . RHAMNALES.

Carpels apocarpous . . . ROSALES.

Carpels consolidated. Seeds 00 . . . SAXIFRAGALES.

Monopetalous.

Capsular or baccate . . . SOLANALES.

Nucamentaceous . . . ECHIALES.

Tricoccous . . . RHAMNALES.

## Sub-class IV.—EPIGYNOUS EXOGENS.

## a. Albumen abundant.

Monochlamydeous . . . ASARALES.

Dichlamydeous, monopetalous . . . CORNALES.

Dichlamydeous, polypetalous.

Seeds solitary . . . UMBELLALES.

Seeds 00 . . . GROSSALES.

## b. Albumen wanting, or in small quantity.

Placenta axile.

Monopetalous . . . CAMPANALES.

Polypetalous . . . MYRTALES.

Placenta parietal . . . CACTALES.



## SUB-CLASS I. DICLINOUS EXOGENS.

The plants thus named never, or at least very rarely, have bisexual flowers, but consist of species in which the stamens constantly appear in one kind of flower, and the pistil in another. They appear to constitute the nearest approach that can be found to Gymnosperms, to which the whole Amental Alliance might in fact be referred, if the carpels would open and present the ovules naked to the action of the pollen. It would be impossible to overlook, on the one hand, the close resemblance which exists between the cones of an *Abies* among Conifers, and the female catkins of a *Ulmus* in the Order of Birchworts; or, on the other, the vegetation of a *Casuarina* Ephedra, and an Amental *Casuarina*.

These and similar Orders must be regarded as the simplest forms of structure which Diclinous Exogens present, their condition reaching its lowest state in Hornworts (*Ceratophyllaceae*). At this part of the Sub-class we have so entire a transition to the Chenopetal Alliance by means of certain Diclinous Chenopods, which form an exception to the general condition of their Order, as to make it clear that the Hypogynous Subclass must parallel with the unisexual Orders.

If we advance along the line of Diclinous Alliances, towards those forms whose organisation is the highest, such as Monoperniales, *Cruciferae* and Papayals, we shall find that all the others have also lateral affections of a not less manifest description. Thus Spurges, Juglandes and Papayals pass into the Perigynous Rhinads, Anacards, and *Pisonifloraceae*; Spurges and Nutmegs stand on the limits of the Hypogynous Hydnariads and *Woodsia*, while the Epigynous Sandalworts and *Loganiads* are closely approached by the Diclinous Helwingiads and Cucurbits.

These facts show, that, although in one direction such a series of affinities may be perceived, as that of which use has been being made, yet that it must be considered to be a very imperfect expression of the relationship borne by the Diclinous to the bisexual Alliances and Orders.

It would be possible to break up the Diclinous Alliances into Hypogynous, Perigynous, and Epigynous clusters; and to some it may appear that such a distribution would have been more logical than what is now proposed; and perhaps that view is correct. But, upon the whole, it is doubtful whether the advantages of that plan would have been equal to some of its disadvantages.



ALLIANCE XVIII. *AMENTALES*.—THE AMENTAL ALLIANCE.

DIAGNOSIS.—*Flowers diclinous, in catkins, achlamydeous or monochlamydeous; carpels superior; embryo small, with little or no albumen.*

About the near alliance of the mass of genera here collected, no reasonable doubt can be entertained; and, in fact, they are associated in almost all systems of classification. Their strictly unisexual flowers, amentaceous inflorescence, and incomplete calyx, afford the most obvious marks of identification. To this, however, the Order of Oleasters offers an exception; those plants are almost universally referred to the vicinity of Daphnads (Thymelacæ), among Perigynous Exogens, because the *Elæagnus* is taken as the type of their structure. I confess, however, that the latter genus seems to be far from offering a correct idea of this peculiar Order, which is much better represented by *Hippophaë* and *Shepherdia*. Indeed, it is open to question whether the genus *Elæagnus* itself would not fall more properly into the ranks of Daphnads. Upon that supposition, no doubt could be entertained of Oleasters finding their most natural station here.

Independently of the relations borne by Beefwoods (*Casuarinacæ*) to the Joint-firs among Gymnogens, it is evident that other strong lateral affinities present themselves. These are more especially manifest between Liquidambars and the Planes of the Urtical Alliance, and between Galeworts and the Crowberries of the Euphorbial Alliance.

If we attempt to trace a passage from Order to Order in the Alliance itself, it will be observed that the winged fruit of Beefwoods is of the same nature as that of their successors the Birchworts; that the latter are imitated by the Liquidambars, which may be almost regarded as polyspermous Alders. If we suppose the two carpels of Liquidambars to lose their partition, and the seeds to be covered with hairs, Willowworts would be the result of the change. At this point the series is interrupted, for there is nothing at present known to connect either Galeworts or Oleasters with Willows; these Orders are rather to be regarded as a modification of Beefwoods and Birchworts, by the substitution of a fleshy for a membranous pericarp. Their true relation will be best expressed thus:

*Joint-firs.*

Beefwoods—Birchworts—Liquidambars—Willowworts.

Galeworts.

Oleasters.

## NATURAL ORDERS OF AMENTALS.

Ovary 1-celled.	Ovule 1 or 2, ascending. Radicle superior . . .	77. CASUARINACÆ.
Ovary 2-celled.	Ovule 1, pendulous. Radicle superior. . . .	78. BETULACÆ.
Ovary 2-celled.	Ovules 00. Seeds winged . . . . .	79. ALTINGIACÆ.
Ovary 1-celled.	Ovules 00. Seeds cottony . . . . .	80. SALICACÆ.
Ovary 1-celled.	Ovule 1, erect. Radicle superior. . . . .	81. MYRICACÆ.
Ovary 1-celled.	Ovule 1, ascending. Radicle inferior . . . .	82. ELÆAGNACÆ.



ORDER LXXVII. CASUARINACEÆ. REICHBEN.

Casuarina, Michx. in Ann. Mus. N. 431. 1819; & Jacq. in Pinet. R. 283. Botania, Jacq. Icon. 222, t. 10, f. 10.

DIAGNOSIS. *Arboreal Elongata*, with a 1-celled ovary, 1 or 2 monospermous, and a superior radicle.

Branching weeping trees, with jointed stems, the internodes of which are sessile. Leaves 9; in their young state, toothed, pilose, decussate. Flowers in spikes, 7-9; each with a single bract, 7 or sessile. Flowers whorled about the articulations of the jointed rachis. Bracts 2, membranous, right and left of a two-lobed calyx, the lobes of which, inward and outward, and inferior at their points, meet at the time of flowering are separated from their base and raised up by the stamens in the form of a taluspedicel-like surface. Stamen 1; filament subulate; anther erect, triangular with parallel contiguous cells opening to a longitudinal fissure. ♀: In dense heads. Rachis not jointed. Calyx 0. Ovary one-celled, with one sessile, inverted orthotropical ovule, or two meeting side by side. Styles 2, united at base. Carpophore sessile, sublong in a cone, thicker in thickened fringed lobes, and erect, coated densely with spiral scales, without stamens; radicle superior.

These are jointed, leafless, weeping, or subarborescent trees, with all the appearance of an Equisetum. Some remarks, that "Casuarina is undoubtedly related to Myrica in its ovaries, its single erect ovule, and its exalbuminous inverted embryo; but it differs in its habit, that it is herbaceous, while Myrica is woody; in a distinct family, which differs from Casuarina in its fructification, especially in its sessile wing continuous wings united between two lateral scales, which, as they grow up, are folded into a compact cone. Myrica, on the contrary, has distinct drooping, but somewhat imbricated by a somewhat fleshy corolla (or calyx), which, although at first hypogynous, is eventually, after fertilization, extended beyond the ovary, with which it is continuous. In both of the ovaries there is no trace in Casuarina, even the lowest scales, surrounding each subovary and a 2-lobed capsule, by its means united to the subovary, because in Casuarina, but united to the lower subovary, together which are blackish or red, that is the drooping of that fruit."

The singular jointed habit, seems to show immediately supposed relationship to Ephedra among Compositae, and it is indeed possible, that Casuarina, differs from Ephedra only in the fact that the former, from Asparagus, is Gymnospermous Order. Following the system the order is prodrone. There is an erect. Scales are right. At least the half-grown erect, or slightly spreading, with a large branch in the apex.

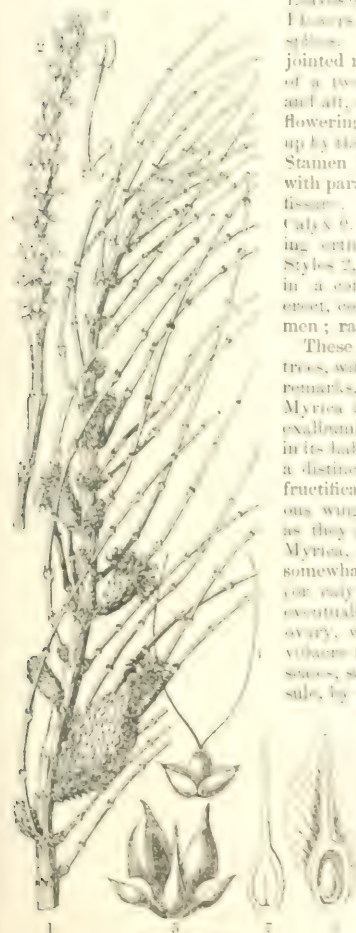


Fig. CLXVII.

from a little way up the side of the ovary cavity, with a large branch in the apex.

Fig. CLXVII.—1. Casuarina 7; 2. of 1; 3. flower; 4. stamen; 5. pistil; 6. seed and embryo of Casuarina, from which the fruit has been taken; 7. seed and embryo of the seed and embryo.



Gœppert has examined the timber anatomically, (*Ann. Sc. N.*, 2 ser., 18. 1.) He finds it to consist of woody bundles separated by medullary rays in the usual way, and divided by interrupted concentric bands of cellular substance. There is no trace of any tendency to form annual growth; for the appearance of it, caused by the concentric bands above mentioned, is illusory.

Brown, in the Appendix to *Flinders's Voyage*, has the following observations on the structure of this remarkable genus:—"In the male flowers of all the species of *Casuarina*, I find an envelope of four valves, as Labillardière has already observed in one species, which he has therefore named *C. quadrivalvis*. But as the two lateral valves of this envelope cover the others in the unexpanded state, and appear to belong to a distinct series, I am inclined to consider them as bractee. On this supposition, which, however, I do not advance with much confidence, the perianthum would consist merely of the anterior and posterior valves; and these, firmly cohering at their apices, are carried up by the anthera, as soon as the filament begins to be produced, while the lateral valves or bractee are persistent; it follows from it, also, that there is no visible perianthum in the female flower; and the remarkable economy of its lateral bractee may, perhaps, be considered as not only affording an additional argument in support of the view now taken of the nature of the parts, but also as in some degree again approximating *Casuarina* to *Conifera*, with which it was formerly associated. The outer coat of the seed or caryopsis of *Casuarina* consists of a very fine membrane, of which the terminal wing is entirely composed; between this membrane and the crustaceous integument of the seed, there exists a stratum of spiral vessels, which Labillardière, not having distinctly seen, has described as an 'integumentum arachnoideum;' and within the crustaceous integument there is a thin proper membrane, closely applied to the embryo, which the same author has entirely overlooked. The existence of spiral vessels, particularly in such quantity, and, as far as can be determined in the dried specimens, unaccompanied by other vessels, is a structure at least very unusual in the integuments of a seed or caryopsis, in which they are very seldom at all visible; and have never, I believe, been observed in such abundance as in this genus, in all whose species they are equally obvious."

These are for the most part Australasian trees or scrubby bushes, chiefly confined to the more temperate latitudes of that vast island. One species only, *C. equisetifolia*, is recorded as inhabiting the tropics of the Indian Archipelago; and another, *C. nodiflora*, is met with in New Caledonia.

Notwithstanding their want of leaves, these plants are remarkable for the excellence of their timber, which is hard, heavy, and resembling the colour of raw beef, whence their Colonial name. The heavy war clubs of the New Hollanders are said to have been fashioned out of it. The bark of *C. equisetifolia* is slightly astringent; that of *C. muricata* is said to be employed in India, in infusion, as a tonic. According to Backhouse, (*Visit to Australia*, App. xxxvii.), the young branches and young cones of *C. quadrivalvis*, or she-oak, when chewed, yield a pleasant acid, extremely useful to persons in want of water. Cattle are also exceedingly fond of them.

#### GENUS.

*Casuarina*, L

NUMBERS. GEN. 1. Sp. 20. (*Endl.*)

*Guttaceæ.*

POSITION.—Myricaceæ.—CASUARINACEÆ—Betulaceæ.

See the *Revisio critica Casuarinarum*, Amst. 1848, 4to, by Miquel, who enumerates 32 supposed species.



ORDER LXXVIII. BETULACEÆ. — BIRCHES.

*Amurstanica, Juss. Gen. 467* (1816, in part). — *Ericaceæ, L. f.* (1820, in part). — *Ericaceæ, Beauv. Bot. 210* (1825). — *Betulaceæ, Berth. Hist. Nat. 100* (1828). — *Betulaceæ, Beauv. Bot. 210* (1825).

**DIAGNOSIS.** — *Amental* *Leaves* with 2-ranked stamens, or stamens pendulous with 2-ranked ovules. — *Stamens* 2-ranked.

Trees or shrubs. Leaves alternate, simple, with the primary vein often running straight from the midrib to the margin; stipules decurrent. Flowers 2-ranked.



FIG. CLXVIII.

Leaves alternate, simple, with the primary vein often running straight from the midrib to the margin; stipules decurrent. Flowers 2-ranked. Stamens distinct, opposite the entire scales; anthers 2-celled. ♀ Ovary free, 2-celled; ovules solitary, pendulous, anatropal; style single, elongate, stigmatic. Fruit thin, indehiscent, by abortion 1-celled, combined with the scales into a cupule. Seeds pendulous; albumen none; embryo straight; cotyledons thick; radicle superior.

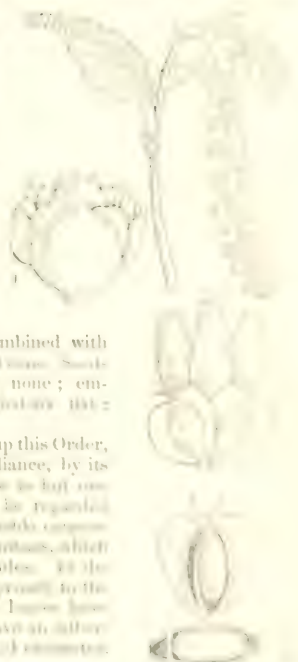


FIG. CLXIX.

The various kinds of Birch and Alder alone make up this Order, which is distinctly defined, among the Amental Alliance, by its fruit consisting of two carpels, in each of which there is but one pendulous ovule. If they had albumen, they might be regarded as Urticeous plants with pendulous seeds and double carpels. Their nearest approach to other Orders is to the Liquidambar, which have a little albumen, and numerous amphitropal ovules. In the male flowers of several species there is a distinct approach to the formation of a four-leaved membranous calyx. The leaves have the same venation as Mastworts, which, however, have an adherent calyx, and thus are distinguished by a well-marked character, independently of their cupule or involucre.

Inhabitants of the woods of Europe, Northern Asia, the Himalayas, and North America, and even making their appearance on the mountains of Peru and Columbia, and in the temperate zone. Their highest limits of existing up to the last limits between land and almost none.

The species are usually timber trees, with drooping barks, some bark becoming red, and sometimes employed as a tanning; but they are chiefly valued for their ornamental ornaments of a landscape. Their wood is often light, and of inferior utility, and that of the Black Birch of North America is one of the hardest and most valuable. The bark of this species has a singular acrid taste; it contains a bitter and a resinous substance called Betuline, or Birch Camphor. The bark extracted from the Common Birch is employed in dressing Russia leather, and given to be with various uses. From *Betula papyracea* the North American Indians strip off the bark, beat it into pulp, and manufacture it into boats, shoe soles, and various domestic utensils. The sap of the Common Birch (*B. alba*) is obtained in the spring by tapping the trunk, and the amount of

FIG. CLXVIII. — ♂ and ♀ catkins of *Betula alba*.

FIG. CLXIX. — *Betula alba*. 1. ♂ flower; 2. ♀ flower; 3. transverse section of a seed; 4. transverse section of a fruit.



the quantity of sugar it contains, ferments, and is converted into an agreeable sparkling wine, much valued in the North of Europe; it has been found to contain free acetic acid and some saline matters; Birch wine has a popular reputation as a remedy for stone and gravel. *Betula nigra* and *lenta* furnish the North Americans with sugar of as good quality as that extracted from the Sugar Maple. The bark of the Common Alder is bitter and astringent, and has been employed for gargles, and with success in cases of ague. The leaves and female catkins are employed by dyers and tanners in some countries.

#### GENERA.

*Betula*, L.  
*Pterocaryon*, Spach.  
*Apterocaryon*, Spach.  
*Betulaster*, Spach.  
*Alnus*, L.  
*Alnaster*, Spach.  
*Clethropsis*, Spach.

NUMBERS. Gen. 2. Sp. 65.

POSITION.—Myricaceæ.—BETULACEÆ.—Altingiaceæ.  
*Pinaceæ*.



## Ogawa, LYNN, ALFINGHAGE, and LUSCHKE

1. *Journal of the American Medical Association*, 279, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675,

Diagnosis. 4 mm  $\times$  1 mm, a thin yellowish white and translucent yellow body.

Pair trees, yielding laburnum. Leaves alternate, ovate to elliptic, with glabrous surfaces at the apex. Stems glabrous. Female catkins longer than the male.



11111

and below them, the young were reared by a dominant female (mother). From 1 to 2 October, numerous individuals (1 to 4000) collected flies, mostly small, with no more than one or two flies per head, and moving at the common temperature of 20°C. On 2 October, collected flies were green, each surrounded by a few adults (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 8

These are long, close with the wings, and they are, however, longer than the 2-celled, many-seeded capsules, which equalled those from all the American *A. glabra* seeds necessary to obtain them, were the presence of a small quantity of

They may be regarded as a connecting group, bridging Phlox on the one hand and Willowworts on the other, and standing intermediate between the latter Smilac and Barchworts. Their basal leaf products have no parallel among natural plants, except to a slight degree in Willowworts.

The tropics of India, and the eastern parts of North America and the Low-land are the countries of this order.

A fragrant resin called Storax is yielded by several species of Liquidambar. That from North America, the produce of *Liquidambar styraciflua*, abounds in America, here—(E. & F.) The principal part, however, of what liquid Storax is used in this country is obtained from Trieste, and is probably collected from *L. orientale*, the Xmas Tree, or Land Wood, of the Cypriots. The bark of these plants is both bitter, and astringent. What liquid Storax comes from the Malayan Archipelago is the bark derived from *Liquidambar Astringia*, a large tree, 150 to 200 feet high, with a reddish brown, smooth, heavy wood, of very close grain, and extremely fragrant.

012115

1. *Large intestine* - 12

N. J. G. P. van der Wal et al.

*M. J. Griffin, J. S. Griffin*

Posterior - Saline - Anterior - Distal  
 Proximal

U.S. CLAN =  $\frac{\text{U.S. population} \times \text{U.S. population}}{\text{U.S. population}}$

According to Griffiths, Seligman, p. 78,  $\alpha$ - $\beta$ -unsaturated  $\beta$ -lactams; but Gutzems is  $\beta$  and therefore can't place  $\alpha$  here, *sup. note* that Griffiths, *See* Hammett, p. 784.



## ORDER LXXX. SALICACEÆ.—WILLOWWORTS.

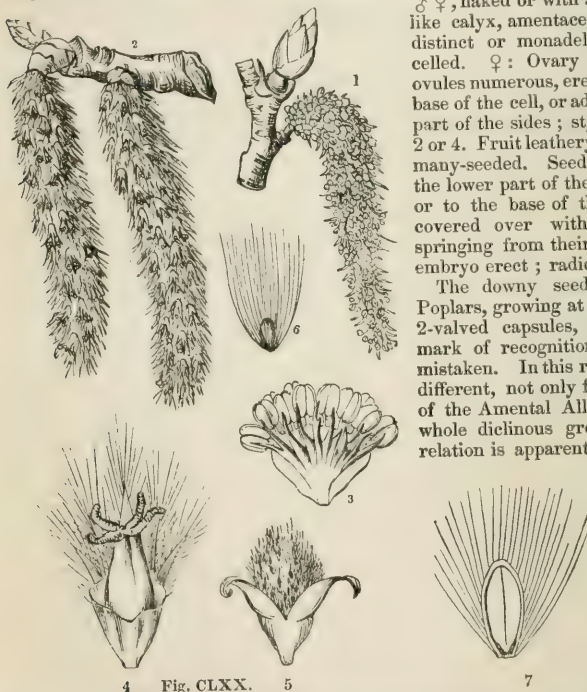
Amentaceæ, *Juss. Gen.* 407. (1789) *in part.*—Salicinæ, *L. C. Richard in Ach. Richard. Elém. de la Bot.*, ed. 4., 560; *Endl. Gen.* xcix.; *Meisner*, p. 348.

DIAGNOSIS.—*Amental Exogens*, with a 1-celled ovary, and numerous cottony seeds.

Trees or shrubs. Leaves alternate, simple, with deliquescent primary veins, and frequently with glands on the edge or stalks; stipules deciduous or persistent. Flowers

♂ ♀, naked or with a membranous cup-like calyx, amentaceous. ♂: Stamens distinct or monadelphous; anthers 2-celled. ♀: Ovary superior, 1-celled; ovules numerous, erect, anatropal, at the base of the cell, or adhering to the lower part of the sides; style 1 or 0; stigmas 2 or 4. Fruit leathery, 1-celled, 2-valved, many-seeded. Seeds either adhering to the lower part of the axis of each valve or to the base of the cell, very small, covered over with long silky hairs springing from their base; albumen 0; embryo erect; radicle inferior.

The downy seeds of Willows and Poplars, growing at the base of leathery 2-valved capsules, give such plants a mark of recognition which cannot be mistaken. In this respect they are quite different, not only from the remainder of the Amental Alliance, but from the whole diclinous group. Their nearest relation is apparently, on the one hand, with Liquidambers, which, like them, have a many-seeded double fruit, and on the other with the Birchworts, with which they agree in their naked male flowers and double fruit. Tamarisks have been



4 Fig. CLXX. 5

regarded as somewhat allied, because their fruit has a similar structure; but the plants are otherwise totally different.

Natives, generally, of the same localities as Birchworts, but extending even further to the north than those plants. The most northern woody plants that are known are the Willows, *Salix arctica* and *polaris*. The Order is found sparingly in Barbary, and there is a species of Willow even in Senegal.

They are valuable trees, either for their timber or for economical purposes, the Willow, the Sallow, and the Poplar being the representatives of the Order. The bark is usually astringent, tonic, and stomachic; that of *Populus tremuloides* is known as a febrifuge in the United States; of *P. tremula* and *alba*, in Europe. A crystallisable principle, called Salicine, has been obtained from *Salix helix*, which, according to Majendie, arrests the progress of a fever with the same power as sulphate of quinia. The best species to prepare it from are said to be *S. fragilis*, *pentandra*, *Russelliana*, *vitellina*, and *purpurea* (the bitterest of all) in Europe, and *ericecephala*, *nigra*, and *conifera*, in the United States. Populine, a substance resembling Mannite, has been obtained from the leaves and bark of some poplars. Poplar buds, especially those of *P. nigra*, *balsamifera*, and

Fig. CLXX. — *Populus*. 1. *nigra* ♂; 2. *tremula* ♀; 3. a male flower; 4. a female flower; 5. a ripe capsule; 6. a seed; 7. the same more magnified, and split to show the embryo.



canaliculi, and besmeared in winter with a resinous, balsamoid, bitter, acrid, excretion, which, under the name of Lacunaria; is said to be diuretic and antiscorbutic; they are also formed into an ointment for tumours, wounds, and burns, and are the basis of a balsam and tincture used for colic, &c. The most important medicine of *Salix alba* is tincture are employed in the preparation of a distilled water called Rose, which has a celebrity in the East for its carmine and pectoral qualities. The same reputation is attached to our *Salix alba* and *resmarinifolia*.

The use of Osiers for wicker-work, of Sallows for charcoal making, is well known. Excellent cricket bats are made from the light wood of *Salix alba* (aspen) (see the Aspen (*Populus tremula*); and various turneryware, and other wood (cross), and implements from the Poplars, which are white-wooded. They have also been used for coarse flooring, but have no strength or durability.

#### GENERA

*Salix*, L.

*Populus*, L.

NUMBERS, GEN. 2. Sp. 230.

POSITION — DICHOTYMOUS — SYMBIOTIC — APOGAMOUS.



## ORDER LXXXI. MYRICACEÆ.—GALEWORTS.

Myricæ, Rich. *Anal. du Fr.* (1808); *Blume Fl. Javæ*; *Barll. Ord. Nat.* 98. (1830); *Endlich. Gen.* lxxxvii; *Meisner*, p. 351.

DIAGNOSIS.—*Amental Exogens*, with a 1-celled ovary and a single erect seed, with a superior radicle.

Leafy shrubs, or small trees, covered with resinous glands and dots; leaves alternate, simple, with or without stipules. Flowers ♂ ♀, amentaceous, naked. ♂ Stamens 2 to 8, generally in the axil of a scale-like bract; anthers 2- or 4-celled, opening lengthwise. ♀ Ovary 1-celled, surrounded by several hypogynous scales; ovule solitary, erect, orthotropal; stigmas 2, subulate, or dilated and petaloid. Fruit drupaceous, often covered with waxy secretions, and, with the hypogynous scales of the ovary, become fleshy and adherent. Seed solitary, erect; embryo without albumen; cotyledons 2, plano-convex; radicle short, superior.



Fig. CLXXII.

Found in the temperate parts of North America, the tropics of South America, the Cape of Good Hope, and India. One species only inhabits the swamps of Europe.

Aromatic shrubs, or trees of considerable size. *Comptonia asplenifolia* possesses astringent and tonic properties, and is much used in the domestic medicine of the United States, in cases of diarrhœa. Benzoic and tannic acids, with a resinous matter, occur in its aromatic bark. Wax is obtained in great abundance from the berries of *Myrica cerifera*, and other species. The fruit of *Myrica sapida* is about as large as a cherry, and, according to Buchanan, is pleasantly acid and eatable in Nepal. *Myrica Gale* yields an ethereal oil of a yellow colour, feeble odour, and mild taste, which after a while becomes slightly warm. Its leaves were formerly used against the itch, and in Sweden as a substitute for hops in brewing. The root of *Myrica cerifera* is said to be emetic, or drastic in large doses.

GENERA.

*Myrica*, L.

| *Gale*, Tourn.

| *Comptonia*, Banks.

| *Clarisia*, R. et P.

NUMBERS. GEN. 3. Sp. 20 ?

*Empetracæ.*

*Juglandacæ.*

POSITION.—*Betulacæ.*—MYRICACEÆ.—*Casuarinacæ.*

*Urticacæ.*

Fig. CLXXII. — *Comptonia asplenifolia*; 1. ♀ of *Myrica cerifera* guarded by its scale; 2 and 3. the same divested of the scale and cut perpendicularly; 4. ♂ of ditto; 5. Fruit of *Myrica Gale*; 6. a perpendicular section; 7. a section of the seed.



## ORDER LXXXII. ELEAGNACEÆ. Oleaceæ.

*Linnaei, Fl. Gen. 76. 1753. — Persoon, Bot. Mon. Gener. Europ. vol. 14. 1805. — Gaertn. — Martius, p. 102.*

**DIAGNOSIS.** *Arborescens, vel fruticosa, vel herbacea, ramis oppositis, alternis, vel verticillis, foliis alternis, oppositis, vel verticillis, ovulis solitariis, ascendentibus, anatropis, stigmatibus simplicibus, subulatis, clavatis.*

Trees or shrubs, usually covered with lepidous scurf. Leaves alternate, or opposite, entire, without stipules. Flowers axillary, often fragrant, in cymes or corymbose bracts. Flowers  $\frac{1}{2}$ , rarely  $\frac{3}{4}$ ,  $\frac{5}{6}$ . Flowers ascendant, each in the axil of a scale-like bract. Sepals 2-4, sometimes united in a cup; stamens 3, 4, or 5, sessile; anthers 2-celled,  $\frac{1}{2}$ , and  $\frac{1}{3}$ . Calyx free, tubular, with a fleshy disk, which often closes it up, persistent; the limb entire, or 2-5 toothed. Ovary free, simple, 1-celled; ovule solitary, ascending, stalked, anatropal; stigma simple, subulate, clavate. Fruit encasuous, inclosed within the calyx become succulent. Seed erect; embryo straight, surrounded by very thin fleshy albumen; radicle short, inferior; cotyledons fleshy.

These plants are regarded by most botanists as being typically hermaphrodite, and hence they are referred to the vicinity of Daphnads; Jussieu himself excluded them from his Dielinous division. But when we consider that out of the genera constituting them, all except *Elæagnus* are  $\frac{1}{2}$   $\frac{3}{4}$  it seems better to station them here, as one of the connecting links between the  $\frac{1}{2}$   $\frac{3}{4}$  and  $\frac{5}{6}$  races. Indeed, the Dielinous genera seem to approach closely to Galeworts, for the quantity of albumen that surrounds their embryo is too inconsiderable to be of importance. Supposing that the Order of Oleasters were not regarded as unisexual, it would then, no doubt, stand in the Perigynous Sub-class, where it would be known from Daphnads by the position of its ovule; and from Proteads, by the valvate irregular calyx, and dehiscent fruit of that Order.

The whole of the northern hemisphere, down to the equator, is occupied more or less by this family, from Canada and Japan to Guiana and Java; they are comparatively rare south of the line.

The fruit of *Hippophaë rhamnoides* is occasionally eaten as a sauce with fish. Professor Santagala has, however, found that it contains a fatty matter of a narcotic nature. Twelve grains given to a moderate-sized dog, in a few hours prostrated the strength of the animal in a most remarkable manner.—*Chim. Gen.* 1844, 121. That of *Elæagnus orientalis* is almost as large as a Jujube, and is known in Persia as an article of the dessert, under the name of Zimzeyd; the drupes of *E. arbuscula*, *conferta*, and others, are eaten in Nepal. The flowers of *Elæagnus orientalis* and *argentea* are highly fragrant, and abound in honey which is esteemed as a remedy for dangerous fevers in some parts of Europe.

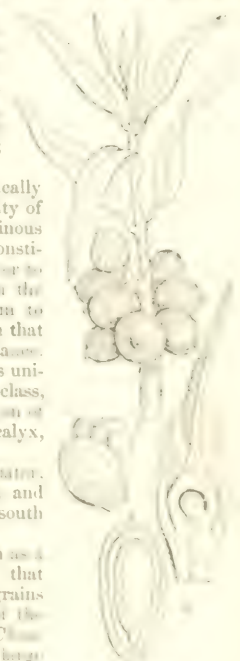


FIG. CLXXXII.

## GENERA.

*Shepherdia*, Nutt.  
*Elaeagnus*, Nutt.

*Hippophaë*, Linn.  
*Condalia*, L. C. Rich.

*Opuntia*, Linn.

NUMBERS. GEN. 4. Sp. 10.

*Hippophaë*

POSITION. MYRTACEÆ. ELÆAGNACEÆ.

FIG. CLXXXIII. *Hippophaë rhamnoides*. 1. a  $\frac{1}{2}$  branch; 2. a perispermous nutlet of seed; 3. a section of a ripe fruit, transverse.



ALLIANCE XIX. *URTICALES*.—THE URTICAL ALLIANCE.

DIAGNOSIS.—*Diclinous Exogens, with scattered monochlamydeous flowers, single superior carpels, and a large embryo lying in a small quantity of albumen.*

The main distinction between this and the Amental Alliance consists in the presence of albumen, and the flowers not being arranged in catkins. The former character, however, fails in several instances, especially in some Artocarpads and Hempworts; so that in reality the amentaceous inflorescence is the only difference that can be at present pointed out to separate two Alliances, which nevertheless appear to be really distinct if regarded as wholes. They touch most closely among the Planes and Artocarpads, which may be referred indifferently to the one Alliance or the other, for both have a quasi-amentaceous inflorescence, and Liquidambars agree with Planes in having albumen, while Artocarpus itself is said to differ from the mass of its order in the want of it. Artocarpus cannot however be separated from Ficus, nor Platanus from Artocarpus, and this seems to justify the place assigned to Artocarpads and Planes in this arrangement.

The Orders themselves do not always rest upon such distinctions as a botanist would wish to discover; this is most especially the case with Hempworts and Morads, which might very well be united. But they may be allowed to remain for the present, because we really know so little about the plants of the Urtical Alliance, that any final distribution of the genera must be premature. It is much to be wished that some one would seriously examine the heaps of undescribed obscure plants related to this part of the vegetable kingdom, to be found in all large herbaria; it would be hardly possible to render a more welcome service to systematical botany.

So many plants of the Chenopodal and Silenial Alliances are ♂ ♀, especially of the former, where Atriplex alone forms a large mass of exceptions to the usually ♂ structure, that we must suppose this to be one of the most remarkable instances of contact between the hypogynous and diclinous sub-classes.

## NATURAL ORDERS OF URTICALS.

- |  |                        |
|--|------------------------|
| <i>Radicle superior. Ovules twin, suspended. Embryo straight, albuminous. Anthers 2-lobed, with vertical fissures . . .</i>              | } 83. STILAGINACEÆ.    |
| <i>Radicle superior. Ovule solitary, erect. Embryo straight, albuminous. Juice limpid. Stipules small, flat . . .</i>                    | } 84. URTICACEÆ.       |
| <i>Radicle inferior. Embryo exalbuminous. Plumule many-leaved, large . . .</i>   | } 85. CERATOPHYLLACEÆ. |
| <i>Radicle superior. Ovule solitary, suspended. Embryo hooked, exalbuminous . . .</i>  | } 86. CANNABINACEÆ.    |
| <i>Radicle superior. Ovules solitary, suspended. Embryo hooked, albuminous. Juice milky . . .</i>  | } 87. MORACEÆ.         |
| <i>Radicle superior. Ovule solitary, erect or suspended. Embryo straight, exalbuminous. Juice milky. Stipules large, convolute . . .</i> | } 88. ARTOCARPACEÆ.    |
| <i>Radicle inferior. Embryo albuminous. Plumule minute. Juice limpid. Stipules large, deciduous . . .</i>                                | } 89. PLATANACEÆ.      |



## ORDER LXXXIII. STILAGINACEÆ. ANTIDESMACEÆ.

Stilaginaceæ, *Agnes De's Classes*, 169. (1824); *Pen. Martius Herb. Lem. Minus*, 1179. — Antidesmaceæ, *Savot Herb. Lem.*, vol. 2. 409. (1839); *Lecl. rev.*, 1. *Mollin.*, 1. 34.

DIAGNOSIS. *Urticæ* *Leaving*, with 2-lobed anthers splitting longitudinally, from suppetent ovules, a straight albuminous calyx, and superior umbels.

Trees or shrubs. Leaves alternate, simple, coriaceous, undivided or toothed. Stipules twin, deciduous. Flowers minute, in axillary shady spikes. Perianth 2-5 parted. Corolla 0.  $\sigma$  Stamens 2, or more, arising from a tumid receptacle; filaments capillary; anthers innate, usually 2-lobed, with a fleshy connective and vertical cells opening transversely.  $\phi$  Ovary tri-, 1-2-celled, often with a conspicuous disk; ovules anatropal, suspended in pairs; stigma sessile, 3-4-toothed. Fruit drupaceous. Seed suspended, sometimes perforated by processes of the putamen; embryo green, with foliaceous cotyledons, lying in the midst of copious fleshy albumen; radicle short, superior.

An obscure Order, whose limits are not ascertained. Judging from the genera *Stilago* and *Antidesma*, it is very near Nettleworts, from which it is chiefly distinguished by a great cushion-shaped disk, inelastic filaments, and anthers split into 2 lobes, which burst transversely at the apex. But *Falconeria* is said to have a 2-celled fruit, and therefore would approach very nearly to the Euphorbial Alliance. On the other hand, *Pyrenacantha*, referred hither by Endlicher, because of its two collateral pendulous ovules, is a milking plant, and wants the peculiar anthers of Antidesmads; but its pierced albumen and embryo are so similar to those of *Phytocrene* (or *Gynoccephalum*), that it had better perhaps be referred to the Artocarpads. The name Antidesmas have much the inflorescence of East Indian Mastworts.

Natives of the East Indies and Madagascar.

These plants appear to be destitute of noxious qualities. Their succulent cuttings dropes are eaten by the natives of the countries where they grow; those of *Antidesma pubescens* are mentioned by Roxburgh, who also states that the skinning dried fruit of *Stilago Binius* is sub-acid and palatable. The leaves of that plant are said not to be deleterious; and, when young, are boiled with potatoes and given in India in cases of syphilis. The leaves of *Antidesma alexitaria* are among the imaginary remedies for serpent bites.

## GENERA.

*Antidesma*, L.

*Stilago*, L.

*Falconeria*, R.

*Stilaginæ*, P.

*Pyrenacantha*, P.

*Phytocrene*, G.

NUMBERS, Gen. 3. Sp. 20.

POSITION.—Urticæ.—STILAGINACEÆ.—Artocarpadæ.

*Corylaceæ*.

FIG. CLXXIV.—*Stilago chamoensis*, 1.  $\sigma$  Flower; 2. fruit (longitudinal); 3.  $\phi$  fruit (transverse); 4. fruit and seed; 5. a perpendicular section of a fruit.



## ORDER LXXXIV. URTICACEÆ.—NETTLEWORKS.

Urticæ, *Juss. Gen.* 400. (1789); *Gaudichaud in Freyc. Voyage*, p. 503. (1826); *Bartl. Ord. Nat.* 105. Urticaceæ, *Endlich. Prodr. Norf.* 37; *Gen.* xciv.; *Meisner*, p. 348.

DIAGNOSIS.—*Urtical Exogens*, with small flat stipules, limpid juice, a solit. erect ovule, a straight albuminous embryo, and superior radicle.

Trees, shrubs, or herbs; never milky. Leaves alternate, usually covered either with asperities or stinging hairs, with membranous stipules, which are deciduous or convolute in vernation. Flowers herbaceous, inconspicuous, ♂ ♀, (occasionally ♂



Fig. CLXXV.

intermixed) scattered, or clustered, or in catkins, or close heads. Calyx membranous, lobed, persistent. ♂ Stamens definite, distinct, inserted into the base of the calyx,

and opposite its lobes; anthers often curved inwards in æstivation, and turned backwards with elasticity when bursting.



Fig. CLXXVI.

♀ Ovary superior, simple; ovule solitary, erect; stigma simple, fringed. Fruit a simple indehiscent nut, surrounded either by the membranous or fleshy calyx. Embryo straight, with fleshy albumen; cotyledons flat; radicle superior.

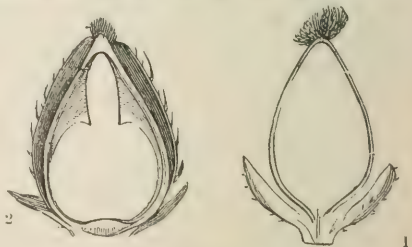


Fig. CLXXVII.

Nettleworks, as now circumscribed, consist almost entirely of rough-leaved plants, which, although they occasionally acquire the stature of trees, have nevertheless little more than a herbaceous texture, their wood being remarkable for its lightness, sponginess, and profusion of cellular tissue. Their great distinction consists in their having a

Fig. CLXXV.—1. Branch of *Procris splendens*; 2. cluster of male and female flowers; 3. a male flower about to expand; 4. the same expanded.

Fig. CLXXVI.—*Parietaria officinalis*; one of the lenticular fruits both whole and divided perpendicularly to show the embryo.

Fig. CLXXVII.—1. A section of the ovary of *Urtica dioica*; 2 the same when ripe, after the embryo is developed.



single erect ovary of a simple torus, the formation of which is in the species, — one when the seed is ripe the embryo is immovably interred, the radicle, possibly, atrophied. (In the present volume of this work the position of the radicle has sometimes, owing to some accident, been Northwards with them to exactly between them, Mimale and Hemipogon, which have a hooked embryo, and from Anisodonta, which have pendulous ones. What differences exist between them and the Urticaceæ are mentioned under this Order. The flowers are occasionally, in part, hermaphrodite, although the great number are absolutely unisexual, and, on this account, they must be regarded as entirely entomophilous with *Chrysomela* in the hypogynous subtribe. They will, however, be found to differ not only in their habitually distinct flowers, but also in their embryos being enclosed in albumen and not external to it as in *Chrysomela*.

Independently of the present volume, termed by Northwards to *Chrysomela* as well as to other Orders in the Urticæ Albumen, we must not lose sight of their very near affinity to the hypogynous backwoods, some of which are ♂ ♀. This has been already alluded to at p. 440, and will be further noticed hereafter.

The species are widely dispersed over every part of the world, appearing in the most northern regions, and in the hottest climates of the tropics; growing on sunny dry walls, where there is scarcely nutriment for a Moss or a *Lichen*, and inhabiting the deepest recesses of the forest. Many follow the steps of man, flourishing on rubbish heaps and waste places around his dwellings.

All the more important of the old Urticaceæ Order having been removed from this place, the qualities of the few that remain are of little interest. Expressive as to the Urticæ genus is their chief characteristic, as is exemplified in the common stinging Nettles, *Urtica dioica*, *urens*, and *pilulifera*, which are, however, not to be compared for an instant with some of the E. Indian species. Linnæus, in his *Plant. med.* describes the effect of gnawing *Urtica crenata* in the Botanic garden at Chelsea: "One of the leaves slightly touched the first three fingers of my left hand; at the time I only perceived a slight pricking, to which I paid no attention. This was at seven in the morning. The pain continued to increase; in an hour it had become intolerable; it seemed as if some one was rubbing my fingers with a hot iron. Nevertheless, there was no remarkable appearance; neither swelling, nor pustule, nor inflammation. The pain rapidly spread along the arm, as far as the armpit. I was then seized with frequent sneezing, and with a copious running at the nose, as if I had caught a violent cold in the head. About noon I experienced a painful contraction of the hand at the jaws, which made me fear an attack of tetanus. I then went to bed, hoping that repose would alleviate my suffering; but it did not abate; on the contrary, it continued nearly the whole of the following night; but I lost the contraction of the jaws about noon in the evening. The next morning the pain began to leave me, and I felt better. I continued to suffer for two days; and the pain returned in full force when I got my hand into water. I did not nearly lose it for nine days." A similar circumstance occurred, with precisely the same symptoms, to a workman in the Calcutta Garden. This man described the sensation, when water was applied to the stung part, to be as if boiling oil was poured over him. Another dangerous species was found by the natives because in Java (*U. stimulans*), but its effects were less violent. Both these plants to be surpassed in virulence by a Nettle called *Darun Satun*, *U. urentissima*, or *poof'choo*, in Timor; the effects of which are said, by the natives, to last for a year, or even to cause death. In some species the acrid fluid is so abundant that it is spontaneously discharged from the whole surface of the leaf. According to tradition the virulence of Nettle juice is owing to the presence of bladders of ammonia. The fruit of *Behmeria caudata* is used advantageously in Brazil in bathing as a relief for hemorrhoidal complaints, and in the same country an extract of *Urtica* mixed with vinegar as a remedy for dysuria. The tincture of the fibres of some species is said that certain has been successfully manufactured from them; the stalks of *Urtica* growing here, even exposed, at one time to be equal in strength to Hemp-stalk. *Urtica lanuginosa*, called *Calouse* in Sumatra, yields an extremely tough cordage in that island. — *Nettle*. Flaggings with nettles has been employed in cases of scalds, burns, &c. Nettles when very young and tender are commonly used as an ingredient in both by the English peasantry, who consider that they purify the blood. The infusion of *Urtica* herbæ are esculent and nutritious; the natives eat them raw, boiled, or roasted; &c. The herbage and seeds of *Urtica membranacea*, an Egyptian plant, are regarded as emmenagogue and aphrodisiac. Several *Parietaria*s, especially *P. communis* and *diffusa*, have had some reputation as refrigerants and diuretics. The leaves, when dried, have been used in polishing mirrors. A decoction of *Urtica dioica* strongly rubbed with vinegar took without giving it any unpleasant flavour; the whole plant is esteemed antiprurient and diuretic. — *Barrett*.



## GENERA.

<i>Urtica</i> , <i>Tournef.</i>	<i>Vaniera</i> , <i>Loureir.</i>	<i>Böhmeria</i> , <i>Jacq.</i>	<i>Pouzolzia</i> , <i>Gaudich.</i>
<i>Urera</i> , <i>Gaudich.</i>	<i>Malaisia</i> , <i>Blanco.</i>	<i>Durétia</i> , <i>Gaudich.</i>	<i>Memorialis</i> , <i>Hamilt.</i>
<i>Laportea</i> , <i>Gaudich.</i>	<i>Schychowskyia</i> , <i>Endl.</i>	<i>Procris</i> , <i>Commers.</i>	<i>Rousselia</i> , <i>Gaudich.</i>
<i>Fleurya</i> , <i>Gaudich.</i>	<i>Pilea</i> , <i>Lindl.</i>	<i>Neraudia</i> , <i>Gaudich.</i>	<i>Soleirolia</i> , <i>Gaudich.</i>
<i>Girardinia</i> , <i>Gaudich.</i>	<i>Dubruellia</i> , <i>Gaudich.</i>	<i>Parietaria</i> , <i>Tournef.</i>	<i>Helxine</i> , <i>Requ.</i>
<i>Elatostema</i> , <i>Forst.</i>	<i>Haynea</i> , <i>Schum.</i>	<i>Freirea</i> , <i>Gaudich.</i>	<i>Forskolea</i> , <i>Linn.</i>
<i>Langeveldia</i> , <i>Gaudich.</i>	<i>Pellionia</i> , <i>Gaudich.</i>	<i>Thaumuria</i> , <i>Gaudich.</i>	<i>Cuidbeja</i> , <i>Forsk.</i>
<i>Sciophila</i> , <i>Gaud.</i>	<i>Splitgerbera</i> , <i>Miq.</i>	<i>Gesnouinia</i> , <i>Gaudich.</i>	? <i>Australina</i> , <i>Gaudich.</i>
<i>Sciobia</i> , <i>Rehb.</i>			

NUMBERS. GEN. 23. Sp. 300. There having been no recent enumeration of the species this is merely a rough estimate. As I find 216 actually described, the number now estimated is probably much too low both for genera and species.

*Chenopodiaceæ.*

POSITION.—*Moraceæ.*—URTICACEÆ.—*Cannabinaeæ.*

*Polygonaceæ.*

## ADDITIONAL GENERA.

<i>Hirtanandra</i> , <i>Miquel</i> , near <i>Pouzolzia</i> .	<i>Hemistylis</i> , <i>Benth.</i>
<i>Dendrocnide</i> , <i>ditto</i> , near <i>Urtica</i> .	? <i>Aphananthe</i> , <i>Planch.</i>
<i>Leucocnide</i> , <i>ditto</i> , near <i>Boehmeria</i> .	? <i>Gironniera</i> , <i>Gaud.</i>
<i>Oreocnide</i> , <i>ditto</i> , ditto.	<i>Nemostigma</i> , <i>Planch.</i>
<i>Myriocarpa</i> , <i>Benth.</i>	? <i>Chaetachne</i> , <i>Planch.</i>
<i>Morocarpus</i> , <i>Zucc.</i>	

*Urtica simensis*, the Sama of Abyssinia, is an acrid species, which, nevertheless, is cooked in that country and eaten as a vegetable.—*Ach. Rich.*

The fine textile material called China Grass, is the fibre of *Boehmeria nivea*, which is hardly different from the Pooah, or Puya, of Nepal and Sikkim, from which excellent cordage and sail-cloth is manufactured in the East Indies.



## Orellana, LXXXV. CERATOPHYLLACEAE—H. 111

[illegible]

**DIAGNOSIS.**—Faintly subcylindrical, tapering, with an anterior mouth, an anal opening anterior, and a large many-jointed abdomen.

Submersed herbs, with dichotomous, solitary, verticillate leaves. Flowers numerous. Calyx anterior, many-parted. 7 Stamens from 12 to 30; filaments monadelphous, united. 1 Ovary superior, 1-celled; with slender peduncle; antheroid; style persistent; stigma diffuse, diffuse. Not 1-seeded, indehiscent, terminated by the horizontal stigma. Seed pendulous, solitary; albumen 0; embryo with 2 cotyledons, plumule many-leaved; radicle inferior.

It would be difficult to name a plant concealing so many more different opinions have been entertained. The seed of the present organisation it scarcely presents a single salt in point for comparison, with the exception of its female being more highly developed. The number of styles, although only two, Schimper has shown, appears to be four; and in consequence of this, Richard placed it near Conifers, with which it seems to me to have no kind of affinity. Nevertheless, Schimper leans towards Richard's view; in order to support which, he calls the male strobili an antherium. De Candeolle traces its affinity to Hippuris and other phyllites, among Hippurites, from which it differs in its segments every; and he inquires whether Najas, which, according to direct testimony, does not belong to the same Order. A great number of plants are among Najas.

PLATE XXXVIII.

1. Head and thorax of the female of the insect, showing the head, antennae, and thorax. 2. Head of the female of the insect, showing the head, antennae, and thorax. 3. Head of the female of the insect, showing the head, antennae, and thorax. 4. Head of the female of the insect, showing the head, antennae, and thorax. 5. Head of the female of the insect, showing the head, antennae, and thorax.

as in Waterloans, (Nehalimans), be a compression of the body of Anemone, enabling the embryo to germinate without assistance, except at (1) is exposed) in the fitting conditions.

Harpagophytum may also be compared with *Chenopodium*, an account of whose flowers, inferior radicle, simple free ovary, and smooth ovary, and the lateral flowers and want of albumen could not be applied to such a comparison. The flowers of *Chenopodium* is the exception, not the rule, and the resemblance of the ovary of *Ceratophyllum* is as much at variance with the character of that ovary, as is the

Fig. CLXXVIII — *Chrysanthemum* L. 1. flower; 2. fruit; 3. longitudinal section of ovary, the style being cut off; 4. fruit; 5. embryo.



inferior radicle is with most of the Urtical Alliance. Such being the case, it seems to me that until some better suggestion shall have been offered than that of stationing Hornworts near the Gymnospermous Conifers, they may be regarded as anomalous plants of the Urtical Alliance.

A singular view is that of Dr. Asa Gray, who would place *Ceratophyllum* near *Nelumbium*, because of its highly developed plumule, for it would be difficult to point out any other resemblance; to this opinion he has been led by the account of the development of the embryo given by M. Adolphe Brongniart *Ann. Sc.* 12. 253, which is only in part correct.

Found in ditches in Europe, North America, Northern Asia, Senegal, Barbary, and India.

These plants have no known use: they have sometimes the heavy smell of *Chara*.

#### GENUS.

*Ceratophyllum*, L.

NUMBERS. GEN. 1. Sp. 1. according to Schleiden; 6 according to Chamisso.

*Chenopodiaceæ.*

POSITION.—Urticaceæ.—CERATOPHYLLACEÆ.-----

*Haloragææ.*



## ORDER LXXXVI. CANNABINACEÆ.—Hempworts.

C. DC. *Prodr.* 1. 469. 1845. 1867. *Mémoires* p. 49.DIAGNOSIS.—*Herb.* *Urticaceæ*, with a solitary suspended seed, and a hooked pedicellate ovary, with a superior inflorescence.

Herbaceous, rarely stemmed, watery plants, with alternate lobed stipulate leaves, and small monospermous flowers. Flowers 2, 3, 4 in racemes or panicles. Calyx five-lacinious, waxy, imbricate-l. Stamens few, opposite the sepals; filaments distinct; anthers terminal, 2-celled, opening longitudinally. ♀ in spikes or cymes. Sepal single, enveloping the ovary. Ovary free, hooked; ovule solitary, pendulous, campylotropal; stigmas 2, subulate, sessile. Fruit indehiscent, with a single suspended seed. Embryo without albumen, hooked or spirally coiled; radicle superior, lying against the back of the cotyledons.

These plants, formerly regarded as a division of Nettleworts, differ from that Order in having their seeds suspended, their embryo coiled up, and in wanting albumen. To the Artocearpads they approach in technical characters, differing chiefly in their embryo; but they have no milky juice, and are widely different in appearance. From Morads they are hardly distinguishable except by the absence of albumen.

Hempworts are found wild in the temperate parts of the Old World, in the northern hemisphere. The Hemp inhabits the cooler parts of India, whence it has been transported to Europe; the Hemp occurs wild in the South Eastern provinces of Europe.

The valuable fibre called Hemp, is produced by *Cannabis sativa*, which is hardly less celebrated for its narcotic qualities. In the elegant language of Endlicher, “*Emollitum exhilarat animum, impotentibus desideriis tristem stultam letitiam provocat et jucundissima somniorum conciliat phantasmata.*” The Turks employ it under the names of Hadschy and Malach. Linnæus speaks of its *vis narcotica, phantastica, dementens, anodyna, et repetitiva.* Given the Hindutents use it to get drunk with, and call it *Dacha*. The Arabians name it *Hashish*. The Brazilian savages delight in its use. It appears to owe its narcotic properties to the presence of a resin which is not formed in Europe. This resin exudes in India from the leaves, slender branches, and flowers; collected into masses it is the *churra* or *cherra* of Nepal. Its odour is fragrant and narcotic, its taste slightly warm, bitterish, and acrid.—*Pharm.* *J. Pharm. L. 406.* The imbricated heads of the common Hop, *Humulus Lupulus*, participate in the properties of beer. Their scales are scattered over with resinous spherical growths which are easily rubbed off, and have a powerful agreeable odour, and bitter taste; they appear to consist of an acrid, ethereal oil, an aromatic resin, wax, extractive, and a bitter principle called *Lupuline*. By pressure Hopheads yield a green liquid called *oil* of Hops. Its young shoots are eaten as Asparagus, and the roots have been employed as a substitute for Sarsaparilla.

## GENERA

*Cannabis*, *Trinervia**Humulus*, *Lupulus**Embelia*, *Trinervia*

## NUMERUS GEN. 2. Sp. 3.

POSITION.—URTIACEÆ.—CANNABINACEÆ.—MORADS.

Fig. CLXXIX.—*Humulus Lupulus*. A, ♂ flower; B, ♀; C, suspended ovary; D, ripe fruit; E, section of it, showing the embryo, with a curved radicle.



## ORDER LXXXVII. MORACEÆ.—MORADS.

Moreæ, *Endl. Prodr.* 40, (1833); *Gaudich. in Freycinet*, 509; *Meisner*, p. 350; *Endl. xcii.*—Phloeosanthæ, *Blume Bijdr.* 436, (1825).—Sycoidæ, *Link Handb.* 1. 292. (1829).

DIAGNOSIS.—*Urtical Exogens, with solitary suspended ovules, and a hooked albuminous embryo with a superior radicle.*

Trees or shrubs, with a milky juice, sometimes climbing. Leaves of various forms and texture, very commonly lobed and rough, with large stipules often rolled up, inclosing the younger leaves, and leaving a ringed scar when they drop off. Flowers



Fig. CLXXX.

very inconspicuous, ♂ ♀, collected in heads, or spikes, or catkins. ♂ calyx 0, or 3-4-parted, imbricated. Stamens 3-4, inserted into the base of the calyx and opposite its segments; filaments generally shrivelled on the inner face; anthers 2-celled, opening lengthwise. ♀ sepals 3-4-5, sometimes in two rows. Ovary 1-celled, occasionally (by accident?) 2-celled. Ovules solitary, pendulous, or amphitropal, with the foramen uppermost; style terminal, bifid, with the lobes often unequal. Fruit, small nuts or utricle, 1-seeded, inclosed within a succulent receptacle, or collected in a fleshy head formed by the consolidated succulent calyx. Seed solitary, with a thin brittle integument. Embryo lying in fleshy albumen, hooked, with the radicle long, superior, folded down towards the cotyledons.

The whole of the genera of this Order have either a remarkably enlarged receptacle, upon or within which the flowers are arranged, as is seen in *Ficus*, and even more strikingly in *Dorstenia*, or a tendency towards its formation is indicated, when the flowers are gathered into heads of a spheroidal form, as in the Mulberry and Osage Orange (*Maclura*). In this manner the Order of Morads passes into that of the Artocarpaceae, from which indeed it hardly differs except in having an abundance of albumen, and a hooked slender embryo. Strictly speaking, however, albumen occurs in the Artocarpaceae in *Phytocrene*, which certainly must belong to them, and in *Pyrenacantha*, which must, I think, be also referred thither, notwithstanding its somewhat different habit. In the last edition of this work, *Batis* was referred to the present Order; but I now see, that while the species so named by Roxburgh certainly stand next to *Morus*, the West Indian plant to which the designation properly applies must be stationed elsewhere.

The tenacity of life in some plants of this family is remarkable. A specimen of *Ficus australis* lived and grew suspended in the air, without earth, in one of the hothouses in the Botanic Garden, Edinburgh, for eight months, without experiencing any apparent inconvenience.

None of the Morads are European, for the Mulberries and common Fig have been brought from the East. The species inhabit the temperate and tropical latitudes of both

Fig. CLXXX.—*Morus alba*. 1. A male flower; 2. clusters of females; 3. a female flower separate; 4. the same with a part of the calyx cut away; 5. a vertical section of a ripe achæmium; 6. a cluster of fruit consisting of succulent calyces enclosing achænia.



hemispheres, often constituting vast forests, in the case of the various species of *Ficus*, which in all hot countries have generally very thick trunks, with extremely strong boughs, and a prodigious crown. Travellers say, that this island with *Ficus* trees is among the most grateful presents of Nature to hot countries; the shade of these magnificent trees refreshing the traveller when he reposes under their immensity with spreading branches and dark green shining foliage. In India, two of the species have attained celebrity. Of these the Banyan tree, so remarkable for its vast trailing branches, is *Ficus indica*; the Pippul or sacred Fig of the same country, readily known by its rootless branches, and its heart-shaped leaves with long attenuated points, is *Ficus religiosa*. Blume also relates, that a *Ficus microcarpa*, which he planted before the door of his house in Java, had in seven years covered a space of above 60 square fathoms with its dense shade. And he describes a sacred specimen of enormous stature, growing in the same island, at a place called Batu Tulus, from whose large branches he gathered as many as 34 species of parasites and epiphytes, which were not, however, half what might have been collected. The genus *Ficus*, indeed, is one of those which travellers describe as most conducing to the peculiarities of a tropical scene. Mr. Hinds (*Journ. N. H.* xv. 100) points out the complex appearance of the main stem of many species; their immense horizontal branches, their proportionate lowness, and the vast number of smaller stems in every stage of development, some just protruding from the horizontal limbs, others hanging midway between the leafy canopy and earth, displaying on each their rounded extremity an enormous spongiola, while many reach the soil, and having attained strength and size act as columns to sustain the whole structure. "The tropical forest abounds with these in every variety of growth and apparent distortion."

Casutehene is furnished by many of this Order in great abundance; all the India Rubber of continental India is obtained from *Ficus elastica*; in Java, other species yield this substance of excellent quality, as do *F. Radula*, elliptica, and prinoidea in America. Their milky fluid is in some instances bland, and actually employed as a beverage; for of the different plants which have been occasionally brought to Europe under the name of Cow trees, most are Figs. One of these has been figured by M. De Candolle, under the name of *Ficus Saussureana*, (*Mém. de la Soc. Phys. de Genève*); and others have been described by M. Desvieux, *Ann. Sc.* 18. 309. The juice is, however, in many cases excessively acrid; that of *Ficus septica* is emetic, and of *F. toxicaria* and *Dæmonia*, a virulent poison; indeed the milky juice of the cultivated Fig itself possesses considerable acridity, causing a burning sensation in the throat when chewed. In some species the juice assumes a resinous

character, when discharged from parts attacked by Cocci, as is the case with *F. indica*, benghalensis, and *Tschia*, which form a sort of gum-resin in the East Indies. Notwithstanding the prevalence of an acrid secretion, the fruit of many species appears to decompose it and convert it into sugar, or some other substance; hence we have the agreeable Fig of the shops from the acrid *Ficus Caribæa*, and a fruit of inferior quality, but still eatable, from *F. religiosa*, *Bennamiana*, *perilla*, *auriculata*, *Rumphii*, *benghalensis*, *aspera*, *Granatum*, and the Egyptian *Sycæmorus*, whose unpurishable wood is said to have been used in the

construction of the cases in which the mummies are enclosed. On the other hand the common Mulberry, *Morus nigra*, has an agreeable sub-acid succulent fruit, for the sake of which it was long since introduced from Persia; and that of the White Mulberry, and other species, both Asiatic and American, is eatable though not esteemed; but these fruits are not entirely harmless, causing diarrhoea if indulged in too freely, and their roots are both cathartic and anthelmintic, denoting the presence in their system of the acid murrelous of the Order. There is also a Brazilian *Ficus anthelmintica*. The Mulberries contain mannite and succinic acid, according to the chemists. Among other uses of less extensive application are the following:—*Dorstenia contrayerva*, *resinosa*, *spiders*, and others, have bitterish roots, and a remarkable disagreeing odour, with a little pungency. They are supposed to be antidotes to the bites of venomous animals, and certainly possess stimulant, subastringent, and tonic qualities; but they lose their efficacy by keeping, and soon become inert. They are astringent, and are

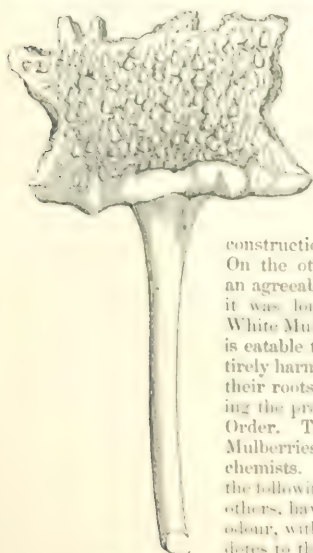


Fig. CLXXXI



employed for the same purposes as *Aristolochia Serpentaria*. A kind of paper is manufactured from *Broussonetia papyrifera*, whose fruit is succulent and insipid. The fruit of *Maclura aurantiaca*, (the Osage Orange), is as large as the fist, orange-coloured, and filled with a yellow fetid slime, with which the native tribes smear their faces when going to war. The wood of *Maclura tinctoria* is the dyewood called fustick; it contains morine, a peculiar colouring matter: its fruit is pleasant, and used in North American medicine, for the same purposes as the black Mulberry in Europe. According to Martius, both it and other species of the same genus yield fustick in Brazil. It is to be observed, that the latter name is also given to the wood of *Rhus Cotinus*. The seeds of *Ficus religiosa* are supposed by the doctors of India to be cooling and alterative. The bark of *Ficus racemosa* is slightly astringent, and has particular virtues in hæmaturia and menorrhagia; the juice of its root is considered a powerful tonic. The white glutinous juice of *Ficus indica* is applied to the teeth and gums, to ease the toothache; it is also considered a valuable application to the soles of the feet when cracked and inflamed; the bark is supposed to be a powerful tonic, and is administered by the Hindoos in diabetes. Is it not possible that the Indian poison with which the Nagas tip their arrows, of the tree that produces which nothing is known, may belong to this tribe? See, for an account of its effects, *Brewster's Journal*, 9. 219.

# GENERA.

<i>Epicarpurus</i> , Blume.	<i>Batis</i> , Roxb.	<i>Maclura</i> , Nutt.	<i>Dorstenia</i> , Plum.
<i>Albrandia</i> , Gaudich.	? <i>Fatoua</i> , Gaudich.	<i>Sycomorpha</i> , Miq.	<i>Syehintum</i> , Desv.
<i>Morus</i> , Tournef.	<i>Broussonetia</i> , Vent.	<i>Ficus</i> , Tournef.	? <i>Kosaria</i> , Forsh.
<i>Ampalus</i> , Boj.	<i>Papyrius</i> , Lam.	<i>Erosma</i> , Both.	

NUMBERS. GEN. 8. Sp. 184.

POSITION.—Cannabinaceæ.—MORACEÆ.—Artocarpacææ.

The Abyssinians eat the inner bark of *Ficus panifica*, which tastes somewhat like bread.—*Äch. Rich.*



Fig. CLXXXII.

# ADDITIONAL GENERA.

<i>Trophis</i> , P. Browne.		<i>Leucosyke</i> , Zollinger.
<i>Sycomorus</i> ,	} <i>Gasparrini</i> , out of <i>Ficus</i> .	<i>Pharmacosycea</i> ,
<i>Caprificus</i> ,		<i>Pogonotrophe</i> ,
<i>Tenorea</i> ,		<i>Syncecia</i> ,
<i>Urostigma</i> ,		<i>Erythrogynæ</i> , Visiani.
<i>Macrophthalma</i> ,		
<i>Visiania</i> ,		
<i>Cystogyne</i> ,		
<i>Galoglychia</i> ,		
<i>Covellia</i> ,		

See Gasparrini, *Ricerche sulla natura del Caprifico e del Fico, e sulla Caprificazione*, 4to, Napoli, 1845.

Fig. CLXXXII.—Perpendicular section of the succulent hollow receptacle of *Ficus Carica*.



## DAME, L. N. XVIII. ARITHMETIC. P. 1. A. 1.

Authors are grateful to the referees for their valuable comments and suggestions.

Fronds or rhizoids, according to milky latex. Lycopodiaceae, simple, thin, black, very large, decussate, striate. *Polygonum* ?  $\pm$ , greenish reddish-brown, with a black or brown, very



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posed of consolidated fleshy calyxes, within which are a multitude of small, round, sessile, parietal, or pendulous, lenticles with scarcely any little albumen attached, with the radii directed towards the vertex of the cone. *Wormholes* small, and few, where the albumen is deficient, thus when it is abundant, they are not apparent.

[illegible]



The massive heads into which the fruits of the Breadfruit tree are collected represent the typical condition of the genera of this Order, whose milky juice has long since suggested its separation from Nettleworts; an opinion, however, in which it was difficult to agree, so long as the Fig and its allies were associated with it by that character. Now, however, that such plants have been more carefully studied, it appears that the old Urticaceous Order should rather be regarded as an Alliance, of which the Artocarpads form one of the Orders. In that point of view the Artocarpads will be distinguished from Hempworts and Morads by their straight embryo with large cotyledons, and from Antidesmads by their anthers and solitary ovules. From Nettleworts the difference is rather one of habit than of real structure, as far as our information at present goes. Brown, indeed, who first proposed the Order, stated that the ovule was erect, which, however, is not the case in either *Artocarpus* or *Maclura*, both which have a suspended ovule. Endlicher, on the other hand, relies upon the absence of albumen; but a trace of it occurs in *Artocarpus*, and in *Phytocrene* it is extremely abundant, to say nothing of *Pyrenacantha*. Perhaps the large convolute stipules may form a further characteristic of Artocarpads.

With respect to *Phytocrene*, which is considered by M. Decaisne identical with *Gynoccephalum*, I find that it is remarkable for a very large quantity of granular albumen, which Blume says is altogether wanting in *Gynoccephalum*; I therefore retain it as a distinct genus.

The Order is not without anomalies. *Phytocrene* and *Pyrenacantha* have copious albumen. In *Antiaris* the ovary adheres to the involucre. It is doubtful whether all yield milk.

The tropics, and the tropics only, of both worlds, are the stations of these plants.

The most important plant of the Order is the Breadfruit, *Artocarpus incisa*, the most virulent the Upas tree, *Antiaris toxicaria*. Like Morads the species afford caoutchouc and an eatable fruit.

The edible quality of the Breadfruit appears to be owing to the presence of a large quantity of starch in its succulent heads. The Jack, *Artocarpus integrifolia*, has a similar quality, but is inferior. The venom of the Antjar poison, *Antiaris toxicaria*, is due to the presence of that most deadly substance strychnia; notwithstanding the exaggerated statements that have been made regarding this tree, the Upas of the Javanese, there remains no doubt that it is a plant of extreme virulence, even linen fabricated from its tough fibre being so acrid as to verify the story of the shirt of Nessus; for it excites the most distressing itching if insufficiently prepared.

However, the seeds are always wholesome; those of a plant nearly allied to *Cecropia*, called *Musanga* by the Africans of the Gold Coast, as well as of *Artocarpus*, are eatable as nuts. The famous Cow Tree, or *Palo de Vaca*, of South America, which yields a copious supply of a rich and wholesome milk, as good as that of the cow, is a species of *Brosimum*. It has been analysed by various chemists, especially Mr. Edward Solley, who found in it as much as 30·57 per cent. of galactin. —See *Phil. Mag.*, Nov. 1837. *Brosimum alicastrum* abounds in a tenacious gummy milk; its leaves and young shoots are much eaten by cattle, but when they become old they cease to be innocuous. The roasted nuts are used instead of bread, and have much



Fig. CLXXXIV.



Fig. CLXXXV.

Fig. CLXXXIV.—1. Nut of *Phytocrene*; 2. the same, showing the seed in its interior; 3. a cross section of the seed, showing the cotyledons and granular albumen; 4. the club-shaped radicle.

Fig. CLXXXV.—*Artocarpus integrifolia*.



the taste of Hazelnuts. The milliness of the sap is in itself an evidence of the presence of mucilage, and accordingly the tree of *Euphorbia* from which mucilage is obtained in that country, is supposed to be *Cassia chytia*, a plant of the Order. A similar substance is obtained from *Cassia peltata*, a very common tropical tree. The bark of this plant, remarkable for its stems being hollow between the nodes, is procured, and used in diarrhoea and gonorrhoea. The light porous wood is supplied by the American savages to give them light by friction.

From a species of *Anturus* called by Mr. Nimmo *Lepanthea* comes a medicine made in Western India by the following singular process: "A branch of the tree, according to the length and diameter of the sack wanted. It is severed at both ends, beaten with clubs till the flave separates from the wood. This done, the sack turned to the bark is turned inside out, and pulled down till the wood is sawed off, with the exception of a small piece left to form the bottom of the sack." These sacks are for general use. A specimen of them was exhibited to the Linnean Society some years ago. Here there is no trace of the virulence of the *Upas* tree, and notwithstanding the fatal character of that species, others appear to be also inert. In the province of Martaban, Dr. Wallach found his Water Vine (*Phytocrene*), whose singular soft and porous wood, charred when wounded a very large quantity of pure and tasteless fluid, which is quite wholesome, and is drunk by the natives. This is an extraordinary exception to the usual character of the Order, and if the plant be really destitute of milk, it will break down very much the limit between *Artocarpads* and *Nettleworts*, unless, indeed, *Phytocrene* is out of its place, which its copious albumen (†) leads one to suspect. Martins says that the fruit of *Peuronia bicolor* is soft and eatable, and worth cultivation, although resembling Snake wood, or Bois de Laitre, so called because of the milkings which it presents, as obtained from the *Brosimum*, called by Aublet *Piratinera guianensis*, a tree 60 or 70 feet high, whose beautiful timber is so hard that it can only be felled by the American ax.

1. The first group of people who are interested in the study of the history of the United States are the people who are interested in the history of the United States.

## C. J. NIERA

Bristlegrass, <i>Setaria</i>	Peppercorn, <i>Am.</i>	<i>Polypogonum, Lour.</i>	<i>Pyramosanthus, Hook.</i>
<i>Paspalum, Ait.</i>	Quercus, <i>Fern.</i>	<i>Utricularia, Cavan.</i>	
<i>Graminaceae, Hum.</i>	Mosses, <i>Cl. S.</i>	<i>Cotyledon, Ait.</i>	<i>Bruea, Gaertn.</i>
Alfalfa, <i>Asch.</i>	Cassia, <i>Willd.</i>	<i>Geraniaceae, R. &amp; S.</i>	<i>Utricularia, Ait.</i>
<i>Leguminosae, N. &amp; S.</i>	Myrica, <i>Willd.</i>	<i>Epilobium, R. &amp; S.</i>	<i>Bruea, Gaertn.</i>
Corn, <i>Willd.</i>	Alnus, <i>Willd.</i>	<i>Nasturtium, H. &amp; A.</i>	<i>Cotyledon, Ait.</i>
<i>Graminaceae, Hum.</i>	Solanum, <i>Willd.</i>	<i>Trapa, P. B.</i>	<i>Apocynum, Willd.</i>
<i>Utricularia, Ait.</i>	<i>Utricularia, Ait.</i>	<i>Struthium, L.</i>	
Utricularia, <i>Willd.</i>	<i>Utricularia, Ait.</i>	<i>Utricularia, Ait.</i>	
<i>Utricularia, Ait.</i>	<i>Utricularia, Ait.</i>	<i>Utricularia, Ait.</i>	

NUMBERS, GEN. 23 Sp. 34!

Position.—MORACEAE.—ARTOCARPACEAE.—PLUMBACEAE.

See Treutl, in *Ann. St. Nat.* 3 ser. VIII 78

### ADDITIONAL GENERA

[illegible]



## PHYTOCRENACEÆ.

"Phytocrenaceæ, *Miers, MSS.*—Phytocreneæ, *Arnott, Elinb. New Phil. Jo.* xvi. 314; *Endl. Gen.* p. 828; *R. Brown in Pl. Jar. rar.* p. 244; *Blume Mus. Bot. Lugd. Bat.* i. 41, fig. vii.—Phytocrene, *Wall. Pl. As. rar.* iii. 11, tab. 216.

"Climbing shrubs, with wood marked by strong medullary rays with intervening bundles of open ducts. Leaves petioled, entire, or palmately lobed, alternate or opposite. Flowers small, ♂ in axillary panicles sometimes glomerately spicated, ♀ in capitular clusters upon simple pedicels, unisexual by abortion. ♂ Sepals 4-5. Petals 4-5, alternate with sepals, and longer than them, valvate in æstivation. Stamens equal in number to, and alternate with, the petals, introrse, 2-lobed, lobes often distinct upon a fleshy connective, divaricate at base, each lobe bursting in front longitudinally, filaments springing from a more or less stipitate androphore, which has sometimes 10 distinct erect lobes intermediate in pairs between the stamens. Ovary sterile. ♀ Sepals and petals as in ♂. Stamens anantherous. Ovarium seated on a stipitate gynophore and confounded with the style, 1-locular (by abortion?): ovules 2, suspended from summit of cell. Style thick and columnar, longer than petals, rising directly from the gynophore with the small cell of the ovary in its base. Stigma large, pulviniform, overhanging the style, sub-bilobed. Drupes either distinct and small or many agglomerated upon a fleshy receptacle



Fig. CLXXXV, *bis*.

into a great fruit the size of a man's head, each component drupe being 4 inches long, distinct upon a short pedicel, with a single indehiscent putamen, which is scrobiculated and 1-locular, with a single seed attached by a long umbilical cord. Albumen copious, simple, or sometimes corrugated into numerous serpentine plates or granular lobes; cotyledons large, foliaceous, flat or plicated lengthways; radicle small, directed towards the hilum.

"The Phytocreneæ were first formed into a distinct group by Dr. Arnott (1834), who thought they were allied to Hernandiaceæ. Endlicher placed them as a suborder of the Menispermaceæ, with which family they will be seen to hold no relation, their only points of resemblance being their climbing habit, the structure of their wood, and their unisexual flowers. By Prof. Lindley the group was not acknowledged, the genera being arranged among Artocarpaceæ, for reasons stated (*huj.* op. 270). Mr. Brown lately has supported the maintenance of the family (*Pl. Jar. rar.* 224), where he combats the view of Dr. Arnott in regard to its affinity, but offers no opinion of his own on this head; Sarcostigma is there placed in that order, but almost simultaneously with this determination I published my reasons for fixing that genus in a peculiar tribe of the Icacinaceæ (*Ann. Nat. Hist. Ser.* 2, x. 113). Phytocrene has been shown to be identical with Gynoecephalum by Decaisne and Trecul, and acknowledged by Blume, who has lately published an ample analysis and character of the genus. Miquelia is there placed by Blume in the same group; but I have offered reasons to show that it cannot belong to the same family, its position being rather near Pyrenacantha (*loc. cit.*) Iodes has opposite leaves, its fruit is small, with simple albumen, and flat cotyledons, features that differ from Phytocrene; it is not therefore certain that it really belongs to this group.

Fig. CLXXXV, *bis*.—Fructification of *Phytocrene macrophylla*—after *Blume*. 1. head of flowers; 2. male flower; 3. calyx; 4. head of female flowers; 5. female flower; 6. seed; 7. section of albumen and embryo; 8. ovules.



"Mr. Brown has justly shown that in this family the two series of floral parts must be considered as in similar cases to the regular calyx and corolla, even when botanists, in order to favour their preconceived views of its affinity, have done so, without ceasing to call the calyx an involucre and the corolla a calyx." Blume, misled by the same views, but allowed his conclusions to run adverse to his own observations, for he describes the ovule of *Phytocrene* to be pendulous from the summit of the cell, while he figures the seed as attached by its funicular cord to the base and the embryo, which he states to be inverted, is there seen to be erect, the natural drying of the seed displays the foliaceous cotyledons as pilated much as the contortuplicated exalbuminous cotyledons; while in the text he pronounces the latter to be the double contortuplicated exalbuminous cotyledons; more lately, however, in a note at the end of the same volume, he corrects the latter portion of this mistake, as far as regards the presence of albumen and the structure of the cotyledons. His method of drawings of the seed agree admirably with the analysis and description of *Evofolium* Lindley, first given in this work (p. 270).

"More complete evidence, however, is still wanting to determine the exact affinity of the group of the *Phytocreneaceae*. In its unisexual flowers, its corolla with valvate aestivation, its alternate stamens, its ovary buried in the base of a thick columnar style, with an overhanging polyanthus stigma, its having 2 ovules always suspended from the summit of a single cell, its fruit with a putamen containing a solitary nucleus, which consists of copious albumen, enclosing an embryo with a small radicle, and foliaceous cotyledons, this family approaches closely more especially through *Isodes* the tribe *Sarcostigmaceae* of the Order *Leucnaceae*. It remains to be ascertained whether, in the *Phytocreneaceae*, the ovary is normally locular; it must be remembered that the genera of the *Leucnaceae* were universally held to be unilocular, until it was lately shown this character is due only to abortion.

"Some relation to the *Elaeagnaceae* may be traced in its unisexual flowers, and if the 10 linear hypogynous lobes of *Nansiatum* be regarded as a double inner row of sterile stamens, the approach is more evident. If, again, we consider the stamens of *Phytocrene* to be 1-celled only by abortion, and normally plurilocular, as in the *Trachnaceae*, with 2 ovules suspended from the summit of the axis, a still closer approximation to the *Elaeagnaceae* would be established; and this position is still further confirmed by its fleshy drupaceous monospermous fruit, the perfection of a small inverted seed in each cell, its albumen divided into lamellar plates, its superior terete radicle, and large foliaceous cotyledons.

"On the supposition of the structure of the seed with exalbuminous contortuplicated cotyledons, as described by Blume, I formerly suggested (loc. cit. x. 145) the relation of *Phytocrene* to *Dipterocarpaceae* or *Tiliaceae*, but the latter evidence of the seminal structure tends to show its nearer relation to *Leucnaceae* and *Elaeagnaceae*.

#### GENERA.

*Phytocrene*, Blume.  
*Sarcostigma*, Tr.  
*Nansiatum*, Tr.  
*Nansiatum*, Blume.

*Isodes*, Tr.  
*Hamamelis*, Tr.

NEWTON ON GENESIS, I. Sp. 8.



## ORDER LXXXIX. PLATANACEÆ.—PLANES.

Platanæ, *Lestiboudois*, according to *Von Martius. Hort. Reg. Monacensis*, p. 46. (1829.) ; *Endl. Gen.* xcvii. ; *Meisner*, p. 347.

DIAGNOSIS.—*Urtical Exogens*, with deciduous sheathing stipules, capitate flowers, limpid juice, an inferior radicle, albuminous embryo, and minute plumule.

Deciduous trees or shrubs. Leaves alternate, palmate, or toothed, with scarious sheathing stipules. Catkins round, pendulous. Flowers ♂ ♀, amentaceous, naked ; the sexes in distinct catkins. ♂ Stamens single, without any floral envelope, but with several small scales and appendages mixed among them ; anthers linear, 2-celled. ♀ Ovary 1-celled, terminated by a thick awl-shaped style, having the stigmatic surface on one side ; ovules solitary, or two, one above the other, suspended, orthotropal. Nuts, in consequence of mutual compression, clavate, with a persistent recurved style. Seeds solitary, or rarely in pairs, pendulous, elongated ; testa thin ; embryo long, antitropal, taper, lying in the axis of very thin albumen ; radicle inferior.

This group of trees or large shrubs, formerly comprehended in the Order once called Amentaceæ, is particularly known by its round heads of flowers, its 1-celled ovary, containing 1 or 2 pendulous ovules, and its embryo lying with the radicle downward, by which it is distinguishable from both Birchworts, Galeworts, and Artocarpads, with all, especially the latter, it has a close affinity. From the latter, indeed, it is chiefly known by the want of calyx, the inferior radicle, the presence of albumen, and the absence of milk ; the habit of the two Orders is much the same. Bartling even combines *Platanus* with that Order, and it must be confessed that the grounds of separating the two are not strong. The simple carpel of the *Planes* refers it rather to the *Urtical* than the *Amental Alliance* : they may be regarded as the connecting link between *Artocarpads* and *Liquidambars*, agreeing most with the former on account of the simplicity of their fruit.

Noble timber-trees, natives of Barbary, the Levant, and North America, and extending even into Cashmere.

They are chiefly cultivated for the sake of their noble appearance ; their broad, shady, palmated leaves being equalled in this country by those of no hardy trees except the Sycamore and its fellow species. The timber is firm and close grained, but brittle, perishable, and only fit for indoor work. That of *P. orientalis* is said, however, to be in request in the East for cabinet work, and even to have been used in ship-building. The timber of *P. occidentalis* is redder, but warps, and will not bear exposure to weather. No use is made of any other part of these plants.

GENUS  
*Platanus*, L.

NUMBERS. GEN. 1. Sp. 6 ?

POSITION.—*Artocarpaceæ*.—*PLATANACEÆ*.  
*Altingiaceæ*.

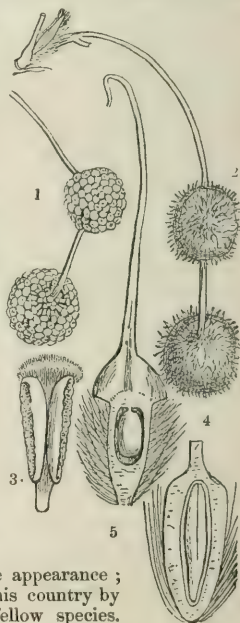


Fig. CLXXXVI.

Fig. CLXXXVI.—*Platanus orientalis*. 1. The ♂ inflorescence ; 2. the ♀ ; 3. an anther ; 4. a perpendicular section of an ovary ; 5. a perpendicular section of a ripe fruit.



## ALLIANCE XX. EUPHORBIALES.—THE EUPHORBIAL ALLIANCE.

**DIAGNOSIS.** *Distichous Eriogonys, with scattered axoid/oblique/long pendulous, superior consolidated carpels, axile placentae, and a large embryo surrounded by abundant albumen.*

The main difference between the Euphorbial and Urtical Alliances consists in the compound consolidated pistil of the former and the simple one of the latter. In other respects they are much the same. Euphorbiales may be regarded then as a higher form of Urticals, and accordingly we find their lateral affinities also pointing to groups with a more complicated structure: as for example to Rhamnales in the polygynous, and Malvales in the hypogynous subclass. They touch Urticals by such a genus as *Lochnerocarpus* among Spargeworts; and Sapinds also bring them to the borders of the Arbutal Alliance. Starworts are to Euphorbiales what Hornworts are to Urticals. Into Garryals they pass by way of the Helwingials, which, if their embryo was not so small, would be almost an inferior fruited form of Spargeworts. The only doubtful part of the Alliance is the *Nepenthes*, whose indefinite scoliiform seeds are very unlike anything else in the Alliance. But it seems difficult to find any better place for the last Order.

## NATURAL ORDERS OF EUPHORBIALES.

<i>Ovules definite, suspended, anatrochal. Radicle superior.</i>	30. EUPHORBACEÆ.
<i>Ovules definite, suspended, campylotrochal. Radicle inferior. Albumen axile.</i>	31. GYNOSPERMACEÆ.
<i>Ovules definite, suspended, anatrochal. Radicle superior. 2 axons lateral.</i>	32. SCITACEÆ.
<i>Ovules definite, suspended, campylotrochal. Radicle superior.</i>	33. CACTACEÆ.
<i>Ovules definite, ascending, anatrochal. Radicle inferior.</i>	34. EUPHORBACEÆ.
<i>Ovules 8-16, ascending. 2 radial, combined into a smooth coat.</i>	35. EUPHORBACEÆ.
<i>Ovules 00, ascending. Radicle inferior. Seeds subglobose.</i>	36. CISTACEÆ.

## ADDITIONAL NOTE UPON EUPHORBIALES.

In *Atropa* the thimble fruit Euphorbia Alliance or Rhamnales is employed in position of construction. Rays appear in the ovary as in the fruit. *Atropa* is a member of the Euphorbiales. The fruit is extremely succulent. The fruit is very persistent, and is sometimes united with the ovary to increase the activity. — *Atropa* is sometimes employed in the construction of the ovary. — *Atropa* is a member of the Euphorbiales.

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The root of *Atropa* is said to be useful when simply boiled. The root of *Atropa* is said to be useful when simply boiled. The root of *Atropa* is said to be useful when simply boiled.

According to *Atropa*, the fruit of *Atropa* is said to be useful when simply boiled. The root of *Atropa* is said to be useful when simply boiled. The root of *Atropa* is said to be useful when simply boiled.



## ORDER XC. EUPHORBIACEÆ.—SPURGEWORTS.

*Euphorbiæ*, Juss. Gen. 385. (1789).—*Euphorbiaceæ*, Ad. de Juss. Monogr. 1824 ; Endl. cexliii. ; *Meisner*, p. 336 ; *Klotzsch in Erichs. Archiv.* 7. 175. (1841).—*Trewiaceæ*, Ed. prior. p. 174.—*Pseudanthææ*, Endl. p. 328.—*Anthoboleæ*, Endl. p. 323?—*Putranjivæ*, Endl. p. 287.

DIAGNOSIS.—*Euphorbial Exogens*, with definite suspended anatropal ovules, scattered flowers, and tricoccous fruit.

Trees, shrubs, or herbaceous plants, often abounding in acrid milk. Leaves opposite or alternate, simple, rarely compound, often with stipules. Flowers axillary or terminal,



Fig. CLXXXVII.

arranged in various ways, sometimes inclosed within an involucre resembling a calyx. Flowers ♂ ♀. Calyx inferior, with various glandular or scaly internal appendages ; (sometimes wanting.) Corolla either consisting of petals or scales equal in number to the sepals, or absent, or sometimes more numerous than the sepals ; sometimes monopetalous. ♂ Stamens definite or indefinite, distinct or monadelphous ; anthers 2-celled, sometimes opening by pores. ♀ Ovary free, sessile, or stalked, 1-2-3- or more celled ; ovules solitary or twin, suspended from the inner angle of the cell ; styles equal in number to the cells, sometimes distinct, sometimes combined, sometimes none ; stigma compound, or single with several lobes. Fruit generally tricoccous, consisting of 3 carpels splitting and separating with elasticity from their common axis, occasionally fleshy and indehiscent. Seeds solitary or twin, suspended, often with an aril ; embryo inclosed in fleshy albumen ; cotyledons flat ; radicle superior.

No group of plants can illustrate better than this the entangled nature of botanical affinities ; for it claims kindred in an almost equal degree with Nettleworts, because of its unisexuality, and with Rhamnads and Mallowworts when that circumstance is left out of consideration. By the school of Jussieu it is considered an apetalous Order, with a tendency to form a corolla ; by myself and others it is regarded as a polypetalous Order, losing its petals in a part of the species.

The reason for considering Spurgeworts as an apetalous Order is because of the want of a corolla in the genera with which European Botanists are most familiar. But if, instead of considering the imperfectly developed genera of Europe as typical of the true structure of the Order, we look to those of tropical countries, we find that the apetalous character by no means holds good with them. In *Aleurites*, for example, the petals are as much developed as in a Malvaceous plant ; the same thing occurs in *Jatropha*, *Elæococca*, and others ; and, in fact, upon looking through the genera described by Adrien de Jussieu in his Monograph, it appears that out of 61 genera no fewer than 32 have petals. The tendency of the Order is, therefore, at least as great to form petals as to want them. Now if this be so, and the separation of sexes be disregarded, it will be found that it is with Mallowworts, on the one hand, and Rhamnads, on the other, that they

Fig. CLXXXVII.—*Andrachne telephioides*. 1. A male flower : 2. a female flower : 3. a pistil with the styles at its base : 4. a transverse section of an ovary : 5. a ripe seed : 6. a vertical section of it.



most agree, and especially with the former. These highly united and jointed appendages are in certain instances so much alike that one might easily mistake them for a staminal tube, as in the case of the Malvaceae, &c., for Malvaceae; the same structure of these bodies, being merely staminal, the definite number of united stamens is a definite number of united bodies, and all further points of resemblance. As to the relationship of Sparganium to Equisetum, it was long ago perceived by Jussieu, and has been most authoritatively by Adolph Brongniart (*Mémoires des Sciences*, 2, 312). DeCandolle, in writing Sparganium from the apertures of the Orders, in his *Prodrôme*, may be considered to have entertained a serious opinion; and Auguste de St. Hilaire inquires whether they are not immediately between Malvaceae and Menispermaceae. A writer in the *Linnæa* (1830), would place this Order next Bythneraceae, and it is no doubt to that form of the Malvaceae that it approaches nearest.

But if, with Jussieu, we consider the separation of sexes a great physiological character, the Order of Spargies will join that of Nettles, through *Equisetum*, a common Californian plant lately discovered by Mr. Benthani, which indeed might be referred indifferently to Spargaceae or Arthrocarpae. And so again with *Androsace*, their character is very little different from that of such drupaceous Spargaceae as *Sarcocolla*. Nor can their close connection with the former Alliance be overpassed: for *Androsace* are scarcely more than Spargaceae with an adherent ovary and minute calyx.

Misled by imperfect information, I formerly proposed a group called *Trewia*; but it has been shown by Klotzsch, who has had the opportunity of examining authentic materials concerning *Trewia*, that it is really a tetracoccous genus of the grassy Order, nearly allied to *Rottbulla* (*Wimmeria*, vol. 157). Although there seems not appear to be any considerable affinity between this tribe and *Cucurbitaceae*, yet it is to be noted that several genera have a scrambling habit, that the number 3 prevails in the ovary of both Orders, and that the genus *Periperygium* has, according to Hasskard, the habit of a *Mentha*. There seems to be nothing in *Putranjiva* to distinguish it from a drupaceous Spargaceae.

In general the structure of Spargaceae is very uniform, and upon the whole there are few extensive Orders in which it is less liable to exceptions. Some, however, of a very striking kind do occur. Foremost among the instances of anomalous structure is the common Spurge, (*Euphorbia*), in which the involucre is so much like a calyx, and sometimes seems to be even augmented with pedicels, that a student finds it difficult to believe that it is



FIG. CXXXVIII

FIG. CXL

really composed of numerous naked ♂ flowers surrounding a ♀ central flower, the calyx and corolla. The real history of the structure is however proved by some writers, and especially by such plants as *Monarda*, in which there is also a number of ♂ flowers surrounding one ♀, but each is furnished with a calyx, and the conspicuousness being disguised *Euphorbia* is reduced to a few scales. In some rare instances of anomalous structure, we find the carpels reduced to 2 in *Mentha* (16, 8 & 1), as seen in *Periperygium* and *Periperygium*, or increased to as many as in *A. americana*, or 12 in *Haba*. The

FIG. CXXXVIII.—1. Flower of *Euphorbia* showing the central female flower surrounded by numerous male flowers. 2, 3, 4. Magnified views of the central female flower, showing the ovary and the surrounding stamens. 5. A magnified view of a single stamen, showing the anther and filament. 6. A magnified view of a single stamen, showing the anther and filament. 7. A magnified view of a single stamen, showing the anther and filament.

FIG. CXXXIX.—The flower of *Euphorbia* showing the central female flower surrounded by numerous male flowers.

FIG. CXL.—A magnified view of a single stamen, showing the anther and filament.



fruit, moreover, which generally splits with elasticity, becomes a drupe in *Sarcococca* and others. Finally, in a few rare instances the albumen is said to be missing.

This extensive Order, which probably does not contain fewer than 2500 species, either described or undescribed, exists in the greatest abundance in equinoctial America, where about 3-8ths of the whole number have been found; sometimes in the form of large trees, frequently of bushes, still more usually of diminutive weeds, and occasionally of deformed, leafless succulent plants, resembling Indian Figs in aspect, but differing from them in every other particular. In the Western world they gradually diminish as they recede from the equator, so that not above 50 species are known in North America, of which a very small number reaches as far as Canada. In the Old World the known tropical proportion is much smaller, arising probably from the species of India and equinoctial Africa not having been described with the same care as those of America; not above an eighth having been found in tropical Africa, including the islands; a sixth is perhaps about the proportion in India. A good many species inhabit the Cape, where, and in the North of Africa, they often assume a succulent habit; and there are almost 120 species from Europe, including the basin of the Mediterranean: of which 16 only are found in Great Britain. and 7 in Sweden.



Fig. CXCI.

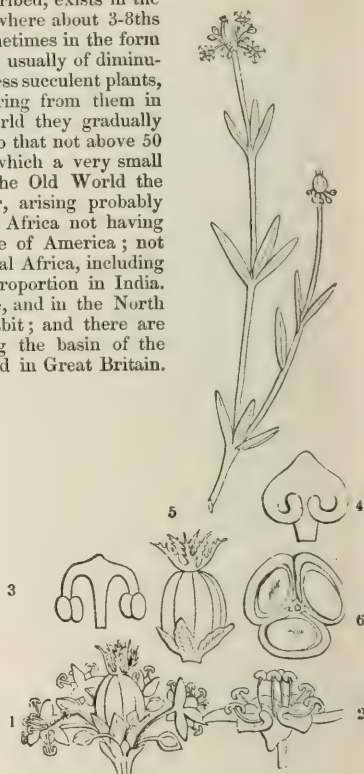


Fig. CXCII.

A very large proportion of these plants is venomous. The poisonous principle resides chiefly in their milky secretion, and is most powerful in proportion as that secretion is abundant. The hairs of some species are stinging. The bark of various species of *Croton* is aromatic, as *Cascarilla*; and the flowers of some, such as *Caturus spiciflorus*, give a tone to the stomach. Many of them act upon the kidneys, as several species of *Phyllanthus*, the leaves of *Mercurialis annua*, and the root of *Ricinus communis*. Several are asserted by authors to be useful in cases of dropsy; some *Phyllanthuses* are emmenagogue. The bark of several *Crotons*, the wood of *Croton Tiglium* and common *Box*, the leaves of the latter, of *Cicca disticha*, and of several *Euphorbias*, are sudorific, and used against syphilis: the root of various *Euphorbias*, the juice of *Commia*, *Anda*, *Mercurialis perennis*, and others, are emetic; the leaves of *Box* and *Mercurialis*, the juice of *Euphorbia*, *Commia*, and *Hura*, the seeds of *Ricinus*, *Croton Tiglium*, &c. &c., are purgative. Many are dangerous, even in small doses, and so fatal in some cases, that no practitioner would dare to prescribe them; as, for example, *Manchineel*. In fact, there is a gradual and insensible transition, in this Order, from mere stimulants to the most dangerous poisons. The latter have usually an acrid character, but some of them are also narcotic, as those *Phyllanthus* the leaves of which are thrown into water to intoxicate fish. Whatever the stimulating principle of *Spurge-worts* may be, it seems to be volatile, because application of heat is sufficient to dissipate it. Thus the

Fig. CXCI—*Fremocarpus setigerus*—*Bentham*. 1. a young pistil; 2. a ripe fruit after dehiscent.

Fig. CXCII—*Monotaxis tridentata*. 1. a ♀ flower surrounded by several ♂ s; 2. a ♂ apart; 3. a stamen; 4. a sepal; 5. a ♀ apart; 6. a transverse section of the ovary.—*Endlicher*.







The roots of some are emetic. According to Deslongchamps, the powdered root of *E. Gerardiana* vomits easily in doses of 18 or 20 grains. The root of *Euphorbia Ipecacuanha* is said, by Barton, to be equal to the true *Ipecacuanha*, in some respects superior; and not unpleasant either in taste or smell. *E. Pithyusa* in the Mediterranean is also esteemed. *Euphorbia thymifolia* is somewhat aromatic and astringent, and is prescribed in India in the diarrhoea of children, and as a vermifuge. In the same way is employed *E. hypericifolia*, a plant of tropical America, which is astringent and somewhat narcotic. Nevertheless *E. balsamifera* has no such qualities, and is eaten when cooked. *E. mauritanica* is also employed as a condiment, but its acridity is by no means inconsiderable; they say it is used to adulterate Scammony. The sap of *E. phosphorea* shines with a phosphorescent light in a warm night in the ancient forests of Brazil.

The genus *Pedilanthus* stands nearest to *Euphorbia*, and is not less potent in its quality; *P. tithymaloides* has an acrid bitter milk; a decoction of the dried shrub of it and *P. padifolius* (called Jewbush) is employed in syphilitic cases, and in amenorrhœa; the root is emetic. Some of the trees again are among the most poisonous of all that tropical countries produce. The juice of *Excæcaria Agallocha*, and even its smoke when burnt, affects the eyes with intolerable pain, as has been experienced occasionally by sailors sent ashore to cut fuel, who, according to Rumphius, having accidentally rubbed their eyes with the juice, became blinded, and ran about like distracted men, and some of them finally lost their sight. This juice is described as being thick, nauseous, and a violent purgative. The smoke of the burning branches is said to injure the eyesight. *Agallochum* or *Aloes wood*, an inflammable, fragrant, resinous substance, has been supposed to belong to this plant, but is really produced by quite a different race. See *AQUILARIACEÆ*. The famous Manchineel tree, *Hippomane Mancinella*, is said to be so poisonous that persons have died from merely sleeping beneath its shade. This is doubted, indeed, by Jacquin, who, however, admits its extremely venomous qualities; but it is by no means improbable that the story has some foundation in truth, particularly if, as Ad. de Jussieu truly remarks, the volatile nature of the poisonous principle of these plants is considered, and the various degrees of susceptibility of such influences in the human constitution. The juice of Manchineel is pure white, and a single drop of it falling on the skin burns like fire, forming an ulcer often difficult to heal. The fruit, which is beautiful, and looks like an apple, is turgid with a similar fluid, but in a milder form; the burning it causes in the lips of those who bite it guards the careless from the danger of eating it. The juice of *Hura crepitans* is stated to be of the same fatal nature as that of *Excæcaria*; its seeds are said to have been administered to negro slaves as purgatives, in number not exceeding 1 or 2, with fatal consequences. The juice of *Sapium aucuparium* is reputed poisonous. A case is mentioned by Tussac of a gardener whose nostrils became swollen and seized with erysipelalous phlegmiasis, in consequence of the fumes only of this plant. The sap of *Commia cochinchinensis* is white, tenacious, emetic, purgative, and deobstruent. Cautiously administered, it is said to be a good medicine in obstinate dropsy and obstructions.

The juice of this Order is not, however, always as dangerous as in the instances just given. That of *Siphonia elastica*, a tree inhabiting Guayana and Brazil, yields the bottle India Rubber, which is known in Europe; in preparing it the natives smear clay moulds with repeated layers of the juice, at the same time drying it in smoke. *Aleurites triloba*, whose seeds will be mentioned presently, exudes a gummy substance which the natives of Tahiti chew; *A. laccifera* furnishes gum lac in Ceylon; and the secretions of certain *Crotons*, viz. *Draco* and *sanguiferum*, become a similar red substance in the tropical parts of America.

Among the crowd of emetic and purgative plants having more or less reputation



Fig. CXCIV.



in the countries where they grow, *roses* are found in the Euphorbiaceæ Group. The root of *Stillingia sylvatica* is reported in Carolina and Florida as a specific in malarial miasma; the same reputation attaching to *Crotonia*, the *Chama* in India, and *Jatropha gossypifolia* (Rosa de Tinto) in Brazil. The *Fraxinea* countries of America, and *involuerata*, *serotina*, and *Mesembryanthemum* of Asia, are noted for their cathartic, diaphoretic, and diuretic qualities. More especially the root of *Fraxinea serotina* is mentioned by the Hindoo doctors, among those medicines which they employ to produce, without altering and correcting the habit, in cases of cachexia, and in old women's complaints attended with anomalous symptoms. The *Mercurialis* or *Dead Mercury* of Europe is another active genus. *M. annua* has a rancorous taste and is slightly purgative; *M. perennis* is much more active, sometimes producing violent vomiting, diarrhoea, a burning heat in the head, convulsions, and death; *M. tomentosa*, a Mediterranean shrub, is used in hydropneumonia; it is vulgarly believed to this day that if thrown out the nose, individuals of this plant, which is distressing, they will ensue boys, and if the female girls; when boiled with other vegetables it acts as a mild purgative. English Mercury must not be confounded with these plants. *S. Coccinea*, a Guianian plant, has a white juice which turns black in oxygen, and is used in place of ink. In *Cissia disticha*, an Indian bush, the root is violently purgative, a decoction of the leaves diaphoretic. A decoction of *Croton perdicipes*, called *Pe de Perdis*, *Aleamphora*, and *Cocallera*, in different provinces of Brazil, is much esteemed as a cure for syphilis, and as a useful diuretic. The root of another species, named *Volante do Campo*, *C. campestris*, has a purgative root, also employed against similar disorders. It is, however, more common to find balsamic juices in the American Genera, among which balsamifer is employed in Martinique in the preparation of the liqueur called *Eau de Mantes*; frankincense is extracted from *C. thurifer* and adapted on the banks of the Amazons; *C. humilis* is used for its aromatic qualities in medicating baths in the West Indies; at the Cape of Good Hope the fragrant *C. guthrieana* is used by the Koras as a perfume; the balsam of *C. virginiana* is mentioned among the substitutes for copaiva; its leaves and bark are considered diaphoretic and antispasmodic; finally, *C. niveus* is a vulnerary.

The most important, however, among the aromatic Spurgeworts are the plants that yield *Cascarilla*, a valuable bitter, tonic, aromatic, stimulant bark, imported from the West Indies. This drug has been at one time referred to *C. Eleuthera*, a Bahama shrub, at another to *C. Cascarilla*, a Jamaica bush, called, from its appearance, *Wax Rosemary*. As a good deal of controversy has been raised respecting this matter, it is as well to state that the question is now set at rest in consequence of the Hon. J. C. Lees, Chief Judge in the Bahamas, having sent home specimens of the *Cascarilla tree*, with the bark itself and the leaves adhering to it. It proves to be this species, concerning which Mr. Lees has favoured me with the following note: "The plant is scarcely known here by the name of *Cascarilla*, but is commonly called *Sweet Wax Bark*, and often *Eleuthera Bark*, because it is chiefly gathered on the island of Eleuthera. It is the only bark receiving the name of *Cascarilla* exported from the Bahamas, where the tree grows in great abundance." It is, however, certain that the *C. pseudo-China* furnishes *Cascarilla* in Mexico, where it is called *Quina blanca*, and *Copalche Bark*; and *C. nitens*, *cascarilla*, *les, nitens* and *suberosa*, seem to be both inferior to the *C. Eleuthera* itself.

The bark of the Asiatic *Bridelia*s is astringent; so is that of *Stylosanthes trifoliata*, whose wood is of a red colour, as is the bark; the former is employed by natives and spars of small vessels in Java. *Hydrocotyle*. The common Box tree, *Alnus sempervirens*, has a bark with qualities similar to those of *Eleuthera*, for which it has been substituted; the leaves are bitter, and very purgative; *pyrethrum* is alleged that they have been used as a substitute for Hops. *Bohl*. The tree that in some parts of Persia where Box trees abound, exceeds in size for employment because it is found impracticable to prevent their browsing on the leaves, which are poisonous. The root and bark of *Codiaeum variegatum* are acrid, and excite a burning sensation in the mouth if chewed; but the leaves are sweet and cooling. The roots, leaves, and young shoots of *Phyllanthus Niruri* are considered in India to be powerful tonic and healing; the leaves are very bitter, and a good stomachic. *Sarcocolla*. Species particularly *P. urinaria*, are powerful diuretics. The bruised leaves of *P. Crotalaria* are used for incubating fishes. The boiled leaves of *Phyllanthus esculentus* are used to be an excellent potherb, for which purpose the plant is cultivated in Andalusia. *Andalusia*. *Cappari*, an Indian herb, has a root which, bruised in hot water, is supposed to be a substitute of its leaves is also reported to be laxative. The flowers of *Cappari* are considered as spoken of as a specific in diarrhoea, either taken in decoction or in wine.

The oil of the seeds is perhaps the most important part of the useful products of this Order. It is often among the most valuable of *Ammoniac* diuretics and purgatives. *Stylosan*



Tigilium, and Pavana, two East Indian trees, whose seeds were formerly called Grana mollarana, stand at the head of this class of medicines; their oil is so acrid as to blister the skin, and it will even act when externally applied to the abdomen. Next to these comes *Ricinus communis*, the castor oil plant, an annual in Europe, a tree in Africa, conspicuous with its broad palmate leaves, which have given it the name of Palma Christi, and spiny capsules, whose use is traceable into remote antiquity, under the name of *Semina cataputiae majoris*; it is found that the albumen of this plant has little activity, but that the virulence resides mainly in the embryo and seed-coats; so that the activity of the oil will depend upon the amount of pressure, &c. to which the seeds may have been subjected; when long boiled their oil is found poisonous. In like manner the seeds of *Omphalea* are said to be eatable if the embryo is extracted, but if this is not done, to be too cathartic for food. Mr. W. Macleay calls this nut "most delicious and wholesome," and speaks of it as the Cohnut or Hognut of Jamaica. Similar qualities reside in the seeds of *Hura crepitans*, the Sand Box tree, and *Curcas purgans* (*Jatropha purgans*, L.); the latter plant is remarkable for the fierce acidity of its seeds, which are commonly called Purgin-nuts. An expressed oil is obtained from them, which is reckoned a valuable external application in itch and herpes; it is also used, a little diluted, in chronic rheumatism. The varnish used by the Chinese for covering boxes is made by boiling this oil with oxide of iron. The leaves are considered as rubefacient and discutient; the milky juice is supposed to have a detergent and healing quality, and dyes linen black. In like manner *Curcas multifidus* produces a purgative oil called Pinhoen, under which name it reaches Europe from South America. From the seeds of *Jatropha glauca* the Hindoos prepare, by careful expression, an oil which, from its stimulating quality, they recommend as an external application in cases of chronic rheumatism and paralytic affections. *Euphorbia Lathyris*, called in English gardens the Caper-bush, to which it has no resemblance, was one of the plants which Charlemagne in his Capitularies commanded to be cultivated in all monastic gardens, for the sake of its purgative seeds, which were called *Semina Cataputiae minoris*; they are acrid like Tigilium, and not mild like those of *Ricinus*. The capsules of this plant are reported to intoxicate fish. *Euphorbia hibernica* is extensively used by the peasantry of Kerry for poisoning, or rather stupefying fish, in the same manner as the exotic *E. piscatoria*. So powerful are its qualities that a small creel or basket, filled with the bruised plant, suffices to poison the fish for several miles down a river.—*Hooker, Brit. Fl. ed. 4. p. 326.* The Anda of Brazil is famous for the purgative qualities of its seeds, which are called Purga da Paulistas, and are fully as powerful as those of the Palma Christi. The Brazilians make use of them in cases of indigestion, in liver complaints, the jaundice, and dropsy. The bark, roasted on the fire, passes as a certain remedy for diarrhoea brought on by cold. According to Maregraaf, the fresh bark steeped in water communicates to it a narcotic property which is sufficient to stupefy fish. The seeds are either eaten raw, or are prepared as an electuary; they yield an oil, which is said by M. Auguste de St. Hilaire to be drying and excellent for painting; in short, much better than nut oil. The Cape colonists collect the fruit of *Hyænanche globosa*, an anomalous plant of this Order, and kill hyænas with mutton rubbed with the powder. The seeds of *Stillingia sebifera*, a Chinese tree, common in most tropical countries, are enveloped in a fatty matter, from which candles are prepared; a mild oil is also furnished by them. Two species of *Elæococca*, the one *E. verrucosa* from Japan, the other *E. vernicia* from China, furnish oil by pressure of their seeds; the former for burning, the latter for painters' work; both too acrid to be used as food.

Nevertheless, some have an eatable fruit; that of *Anda* and *Omphalea* has been already mentioned. *Aleurites triloba*, a Mollucca tree, has much reputation for its nuts, which are reported to be aphrodisiac; and the seeds of *Conceveiba guianensis* are said to be delicious. The succulent fruit of *Cicca disticha* and *racemosa* is sub-acid, cooling, and wholesome; its leaves are sudorific, and its seeds cathartic. The capsules of *Cluytia collina* are poisonous, according to Roxburgh. *Emblica officinalis* also, has an acrid fruit, which in India is made into a pickle; when ripe and dry it is astringent, and has been employed, under the name of *Myrobalani Emblici*, against diarrhoea, dysentery, and cholera.

It is not a little remarkable, that here, as in so many other cases, we should find in a very dangerous Natural Order such an abundant secretion of starch as renders certain species useful for food when the acrid matter is removed. This is most especially the case with the Mandioc plant, *Manihot utilissima*, *Pohl*, (*Jatropha manihot*, L.) a shrub about 8 feet high, extensively cultivated for food all over the tropical parts of the world. Of this plant the large root, weighing as much as 30lbs., is full of venomous juice, which if taken internally produces death. The roots are rasped, the pulp well bruised, and then thoroughly washed, after which the mark is placed on iron plates to be heated. In this way the venom is washed out or driven off, and the residue becomes Cassava.



The powder which floats off in the water is very pure starch, which, when it settles down, becomes Tapioca. Marshmallows, Fild' Amour (or, that a favourite treat).

*Crocodon quimpelobus* (Jablonskians, 1873) is recorded with hairs which are severely, as indeed occurs elsewhere in this Order. The form of its bristles and scales is distinctive. The root of another species, *C. isidiformis*, is used by the same region. Martine in Mexico and Canada.

A few yield dyes. Turnsole, a well-known purple dye, which becomes blue with the application of ammonia, is the impregnated juice of *Crotophaga tinctoria* (*maria*) found in the southern parts of Europe. In June the seed, and the seeds containing, as in others of this Order. Similar colour are found in other species of *Crotophaga*, in some *Crotons*, *Argythamnia*, *Ditassa* and *Claoxylon*. The seed coats of *Houttuynia tinctoria* are covered with a mealy powder which gives a scarlet colour, as does also its root. *Maipromma brasiliensis*, or the *Marmelão do Campo de Brazil*, yields a black dye, which is, however, fugitive; a decoction of its root is also administered in derangement of the stomach; according to Auguste de St. Hilaire, it is destitute of milky juice.

The timber of *Buxus sempervirens* is remarkable for its hardness and compactness, whence its value to wood engravers. There is no reason to believe that the timber imported from the coast of Africa, under the name of African Teak, belongs to some type of the Order. For further information as to the uses of Spurge-worts, see *Martius Mal.* *Malles Brasilienses*.

## COLNOLIA

- [illegible]



Podostachys, Kl.	Cluytia, Ait.	Glochidonopsis, Adr. Juss.	Adenocrepis, Blum.
Astraea, Kl.	Clutia, Boerh.	Glochidion, Forst.	Drypetes, Vahl.
Ocaila, Kl.	Altora, Adans.	Bradleya, Banks.	Sarcococca, Lindl.
Eutropia, Kt.	Cratochwila, Neck.	Gynoon, Adr. Juss.	Putranjiva, Wall.
Cleodora, Kl.	Andrachne, Linn.	Scepasma, Blum.	Nageia, Gertn.
Timandra, Kl.	Eracissa, Forsk.	Epistylum, Swartz.	Hyenanche, Lamb
Medea, Kl.	Limnecum, Forsk.	Eriococcus, Hassk.	Toxicodendron, "nunb.
Crozophora, Neck.	Arachne, Neck.	Stylodiscus, Benn.	
Tournefortia, Scop.	Sauropus, Blum.	Poranthera, Rudg	Doubtful Genera.
Chiroptetalum, Adr. Juss.	Agyncea, Linn.		Podocalyx, Kl.
Caperonia, St. Hil.	Leiocarpus, Blum.		? Anthobolus, R. Br.
Cavanilla, Fl. Flum.	Mieranthea, Desf.		Meborea, Aubl.
? Schinza, Dennst.	Pseudanthus, Sieb.		Tephrranthus, Neck
Ditaxis, Vahl.	Menarda, Commers.		Ægotoxicum, Ruiz et Pav.
Monotaxis, Brongn.	Xylophylla, Linn.		Ætotoxicum, id.
Argythamnia, P. Br.	Genesiphylla, Herit.		Margaritaria, Linn f.
Ateramnus, P. Br.	Phyllanthus, Linn.		Suregada, Roxb.
Phylla, Kl.	Niruri, Adans.		Hexadica, Lour.
Trigonostemon, Blum.	Nymphanthus, Lour.		Homonoia, Lour.
Trigostemon, Blum.	? Cathetus, Lour.		Cladodes, Lour.
Ryparia, Blum.	? Breyria, Forst.		Echinus, Lour.
Ryparosa, Blum.	Melanthesa, Blum.		? Ulassium, Rumph.
	Asterandra, Kl.		Lascadium, Raf.
VI.—PHYLLANTHÆÆ.	Kirganelia, Juss.		Rhytis, Lour.
Ovules in pairs. Stamens in the centre of the flower.	Ardenghetia, Commers.		Baccaurea, Lour.
	Embllica, Gärtn.		Lumanaja, Blanc
	Cicca, Linn.		Lunasia, Blanc.
	Cheramelia, Rumph.		Dovyalis, E. Mey.
Cyclostemon, Blum.	? Tricaryum, Lour.		Desfontenea, Fl. Fl.
Enchididum, Jack.	Leptonema, Adr. Juss.		Mainea, Fl. Fl.
Briedelia, Willd.	Anisonema, Adr. Juss.		Plagiopteron.
Heydia, Dennst.			

NUMBERS. GEN. 191. Sp. 2500 ?

Rhamnaceæ.

Byttneriaceæ.

POSITION.—Empetraceæ.—EUPHORBIACEÆ.—Scepaceæ.

Helwingiaceæ.

**GYROSTEMONEÆ.** (Endl. Gen. p. 978; Meisner, Gen. p. 322). Trees or shrubs inhabiting New Holland. Leaves alternate, entire, feather-veined, without stipules. ♂ Calyx 6-7-lobed. Corolla 0. Stamens indefinite, distinct, with anthers bursting longitudinally. ♀ Calyx cup-shaped, 6-7-lobed. Corolla 0. Carpels 00, collected round a flat central torus, 2-seeded, with suspended campylotropal ovules. Fruit composed of several membranous cases, arranged in a ring. Seed with a strophilate hilum. Embryo hooked round mealy albumen, with linear incumbent cotyledons and a slender inferior radicle.—Two genera and three species at present constitute this group, about whose relationship we have at present no certain evidence. Because of their unisexual imperfect flowers, numerous consolidated carpels, and suspended ovules, they are related to Spurge-worts, and especially to the genus *Hura*; but they cannot be referred to them if Endlicher's statement is correct, that the albumen is mealy and the radicle inferior. Hooker and others station it in the Urtical Alliance, but its composite fruit, mealy albumen, and inferior radicle, do not justify that opinion. Desfontaines and Endlicher regard it as a form of the Mallow-worts, but the separated sexes, free stamens, peculiar albumen, and apetalous flowers are unfavourable to that supposition. Finally, Meisner after referring it to Lindenblossoms, has come to the conclusion that it ought to be associated with Phytolaccads; and if the flowers were not unisexual this opinion would have great weight: for it must be admitted that the plants under consideration have much the structure of that Natural Order. Nevertheless it seems for the present most advisable to associate Gyrostemonads with unisexual Orders, among which they may be looked upon as a passage to the Phytolaccads in the Chenopodal Alliance.

## GENERA.

Gyrostemon, Desf.

Codonocarpus, Cunningham.

NUMBERS. GEN. 2. Sp. 3.

## ADDITIONAL GENERA, &amp;c.

Lopadocalyx = Olax.	Peltandra, Wight,	} near Phyllanthus.
Alectorocrotonum, Schlecht., near Euphorbia.	Leptopus, Desf.	
Ophthalmobolapton, Allenão = ? Hippomane.	Ceratogynum, Wight,	
Rhopalostylis, Miers, next Botryanthæ.	Macraea, Wight,	
Micrococca, Benth.	Reidia, Wight,	
Erythrococca, Benth.	Glochisandra, Wight, near Glochidion.	
Sarcoclinium, Wight.	Stylodiscus = { Microclaus, Wight & Arn.	
Givotia, Griseb.	{ Bischoffia, Blume.	
Lasiostylis, Pral. near Alchornea.	Proserius, Dalzell, near Buxus.	
Bertya, Planchon, near Calyptrostigma.	Goughia, Wight, near Sarcococca.	
Aphora, Nutt. = Serophyton.		
Zinostachys, Kltzsch,	Oldfieldia, Bentham.	
Pycnocoma, Benth.	Galearia, Zolling.	
Agrostistachys, Dalzell,	Cleistanthus, Hook. fl.	
Stachystemon, Planchon, near Pseudanthus.	Microdesmis, Planchon.	
Dovyalis, E. Mey.		

(See note at page 273.)



## Dana, A.C.L. - SEPACRE - 00000000

See also: B1, pp. 171–180; *Journal of the American Medical Association*, 2002, 288, 1000–1001; *Medical Record*, 2002, 134, 1000–1001.

DISCUSSION.—*Euphyasial* Euprasia, with 7 members in 3 genera, shows a unique but somewhat novel, and it appears evident.

*Type*.—Leaves copious, alternate, with numerous stipules at both the sides of the petiole. Flowers 7-8; stamens 6. Calyx 4-leaved, imbricate, corolla

minute and membranous. Stomachs 2, the  
 segments short, straight, 1 tubular, the other  
 dilated, opening by long-tubed parallel  
 setae; collectively the tracheae. 2 tracheal  
 villary processes. Calyx of 6 segments  
 whorled, free; the inner ones are spread at  
 least 4-fold. Ovary 2-celled; each cell  
 with two short elongated lobes, or with  
 4 equal fringed ones; ovules in pairs, lateral,  
 pendulous, anatropal, with broad base  
 projecting from the placenta and covering  
 over the foramen; their ends often buried  
 in hairs projecting from the base of the cell.  
 [In *Lepidobolus* Rostk. the ovary  
 1-celled, 2-celled, 4-celled; the archespor-  
 tial, tough, and separable from the friable  
 sarcotesta. Seeds 2 or 4, compressed  
 in a somewhat oval; embryo, green, composed  
 of albumen, with obovate cotyledons and a  
 radicle next the hilum. *L. sp.*

There is that the European Alliance joins the Anterior; for the phloes of the second order may be regarded as Anterior Spurgeworts. In their male state they have in the aspect of Masturbats or Intercourts, and one of them has actually been called an Alms by Roxburgh; but the females have more the appearance of Antiaris, or of some such critical genus. The truth, which is very remarkable, I only know from Roxburgh's account, the substance of which is quoted from the *Flora Indica*. The manner in which the filices of the present order

the foreman (I believe not till after impregnation) is exceedingly curious, though it is doubtful what ultimately becomes of it. In the genus *Sespa* the ends of the pedicels are buried in a thick mass of hairs proceeding from the placental suture next to the base of the cell. *Forestiera* does not appear to differ from *Spargani* more than the genus of Spurge-worms from each other. It has no anther, and its fruit is achenes, but it is amentaceous. *Piptolepis* of Benthams, placed next it by Endlicher, seems to be very different, on account of its hermaphrodite flowers.

Natives of the tropical forests of India.

The wood of the *Kikra*, *Lepidosiachys Roxburghii*, is very hard and is used for various economical purposes.

0123456789

Year	Population	Area	Population	Area
1950	100,000	100,000	100,000	100,000
1960	150,000	150,000	150,000	150,000
1970	200,000	200,000	200,000	200,000
1980	250,000	250,000	250,000	250,000
1990	300,000	300,000	300,000	300,000
2000	350,000	350,000	350,000	350,000
2010	400,000	400,000	400,000	400,000
2020	450,000	450,000	450,000	450,000
2030	500,000	500,000	500,000	500,000
2040	550,000	550,000	550,000	550,000
2050	600,000	600,000	600,000	600,000
2060	650,000	650,000	650,000	650,000
2070	700,000	700,000	700,000	700,000
2080	750,000	750,000	750,000	750,000
2090	800,000	800,000	800,000	800,000
2100	850,000	850,000	850,000	850,000

Tulane thinks that this value could be negative in experiments. And, in fact, it is so. But

## Neyman, C. R. 1938. p. 11.

Position	Emblem	Signature
President		
Vice-President		
Secretary		
Treasurer		
Member		

The CXCV-Super algorithm (a choice in  $\mathcal{A}$  outlined in § 3.4) brought  $\lambda = 0.8$  from  $\lambda = 0$  in CXCV,  $\lambda$  an arbitrary guess, without the need for a line search. The algorithm also  $\lambda = 0$  in a reasonable number of iterations.



## ORDER XCII. CALLITRICHACEÆ.—STARWORTS.

*Callitrichinææ*, *Link. Enum.* 1. 7. (1821); *Lavielle in Ann. Soc. Linn. Par.* p. 229; *DC. Prodr.* 3. 71; *Ed. pr.* (1836); *Endl. lxxxiv.*; *Meisn.* p. 336.

DIAGNOSIS.—*Euphorbial aquatic Exogens, with definite suspended anatropal ovules, and a superior radicle.*

Small aquatic herbaceous plants, with opposite, simple, entire leaves. Flowers axillary, solitary, very minute. Flowers unisexual, monœcious, naked, with 2 fistular coloured bracts. ♂ Stamen hypogynous, single, rarely 2; filament filiform, furrowed along the middle; anther reniform, 1-celled, 2-valved; the valves opening fore and aft. ♀ Ovary solitary, 4-cornered, 4-celled; ovules solitary, attached to the axis, suspended, amphitropal; styles 2, right and left, subulate; stigmas simple points. Fruit 4-celled, 4-seeded, indehiscent. Seeds peltate; embryo inverted in the axis of fleshy albumen; radicle very long, curved, superior; cotyledons very short.

I have formerly remarked, that “the affinity of this Order to other dicotyledons appears to be of the same nature as that borne by *Lemna* to Monocotyledons: they each exhibit the lowest degree of organisation known in their respective classes.” Brown considers the Order allied to Hippurids: an opinion in which Botanists seem disposed to concur. The great objection to it is this; Hippurids are a reduced form of the exalbuminous Onagrad, with the petals often absent, and the calyx sometimes diminished to what seems a mere rim; but in reality, in consequence of the ovary being adherent, the whole of the tube of the calyx as well as its rim remains adhering to the ovary, so that the calyx is not in fact materially diminished; but Starworts are absolutely destitute of a calyx and are albuminous. These circumstances, and the unisexual flowers of the Order, seem to point to a widely different station, and accordingly, in the last edition of this work, it was arranged among the Incomplete Orders—in the neighbourhood of Mossweeds. It must, however, be confessed that its relation to these plants is one of analogy rather than of affinity. Nevertheless, Endlicher places it in the same situation, remarking, however, that it is perhaps an aquatic form of Spurgeworts. And in this he seems to be right; at all events it differs so little from that Order, except in its indehiscent fruit and amphitropal ovules, that unless we should hereafter be able to employ internal structure for high systematical divisions, it is in the *Euphorbial Alliance* that this plant will remain. It is doubtful indeed whether it ought, in the present state of our knowledge, to be regarded as an independent Order.

Natives of still waters in Europe and North America.

The uses are unknown.

## GENUS.

*Callitriche*, *L.*

NUMBERS. GEN. 1. Sp. 6.

*Ceratophyllaceæ?*

POSITION.—*Euphorbiaceæ*.—CALLITRICHACEÆ.—

*Haloragaceæ.*

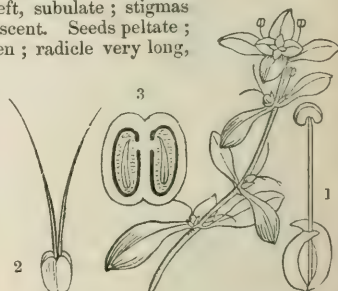


Fig. CXCVI.

Fig CXCVI.—*Callitriche verna* 1. a ♂ flower; 2. a ♀; 3. a perpendicular section of the ripe fruit.



ORDER XCIII EMPETRACEÆ. — CROWBERRIES.

*Empetrum*.—*Nutt. bot. 2, 222* (*Trans. Am. Entom. Soc. Phil. Acad. 1846*); *Humb. et Bon. Mus. 1, 273* (1827); *Engelm. bot. Mexic. 1, 38*.

DIAGNOSIS.—*Leaves of Empetrum*, with stipules ascending antepetal, and no superior radicle.

Small acid shrubs with heathlike evergreen leaves without stipules, and minute flowers in their axils. Flowers 1-7. Sepals hypogynous persistent indurated bony, the innermost of which are sometimes petaloid, or even combined into a monopetalous corolla (as in *Oalesia*). Stamens equal in number to the inner sepals, and alternate with them; anthers roundish, 2-celled, the cells distinct, bursting longitudinally. Ovary free, seated in a fleshy disk, 3-6 or 7-celled; ovules solitary, anatropal, ascending; style 1; stigma radiating, the number of its rays corresponding with the cells of the ovary. Fruit fleshy, seated in the persistent calyx, 3-6 or 7-celled; the coating of the cells bony. Seeds solitary, ascending; embryo taper, in the axis of fleshy watery albumen; radicle inferior.

This little group can in nowise be separated from Spurge-worts, from which indeed it is scarcely distinguishable by any positive character except the ascending seeds and inferior radicle. In habit too it quite corresponds with such heath-like genera of Spurge-worts as *Micranthemum* and *Pseudanthus*, which do not seem to differ from that Order.

A very small group, comprising a few species from the North of Europe, North America, the South of Europe, and the Straits of Magellan.

The leaves and fruit are slightly acid. The black berries of the Crowberry, *Empetrum nigrum*, sub-acid and unpleasant to the taste, are eaten in the arctic parts of Europe, and are regarded there as scorbutic and diuretic; the Greenlanders prepare a fermented liquor from them. The white berries of the *Camarinhira* (*Corema*) are employed by the Portuguese in preparing an acidulous beverage, which the domestic physicians esteem in fevers. — *End.*



FIG. CXCIII.

GENERA.

- Empetrum*, L.
- Corema*, H. & A.
- Ceratiola*, M. & A.
- Oalesia*, Tuckerm.
- Emmenanthe*, Kl. & Schum.

NUMBERS. GEN. 1. Sp. 1.

*Emmenanthe*

POSITION. Empetraceæ. — EMPETRACEÆ.

FIG. CXCIII.—*Ceratiola gracilis*. 1. a ♂ flower, b a ♀ flower; 2. a cross-section of the fruit, with the seeds removed to show the ovules; 3. ripe fruit; 4. section across seed; 5. embryo.



**BATIDÆÆ.**—(*Martius Conspectus*, No. 70, p. 13; *Meisner, Gen.* p. 349.) Shrubs inhabiting salt marshes, with opposite succulent leaves, having no stipules. Flowers ♂ ♀ in spikes. ♂ Scales of the spike imbricated, each enclosing a bivalve membranous calyx, with the valves parallel with

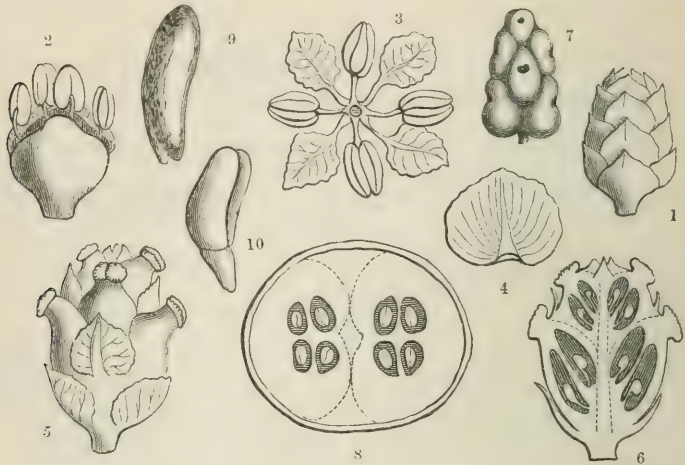


Fig. CXCXVIII.

the bract. Petals 4, unguiculate, very minute and membranous; stamens 4, alternating with the petals and longer; anthers oblong, introrse, with linear thin filaments. ♀ Flowers very fleshy, axillary to membranous reniform bracts, absolutely naked, arranged in a short 4-rowed cone, and completely consolidated except at the top of the ovary. Stigma cushion-shaped, 2-lobed, with the lobes right and left. Ovary 4-celled, with the cells in lateral pairs; ovules solitary, anatropal, on a long erect funiculus. Fruit a succulent cone; the cells bony, but easily splitting at the two sutures. Seed obovate, with a very thin testa. Embryo exalbuminous, straight, with oblong plano-convex cotyledons, about twice as long as the conical inferior radicle.

It will be seen that the above character is, in some respects, different from that given in the last edition, from very bad crushed materials. The real structure of the genus has been lately ascertained by Dr. Torrey, to whom I am indebted for a proof of an unpublished plate intended for the Smithsonian contributions, out of which the details in the accompanying woodcut have been taken. His observations I have been enabled to verify, so far as the ♂ flowers and the fruit are concerned, by specimens given me by Sir Wm. Hooker. Young females I have never seen. The evidence now accumulated seems, however, to confirm altogether the approximation of the genus to *Empetrum*, with which it probably will be hereafter associated.

Martius places the plant between *Podostemaceæ* and *Salicaceæ*; Meisner after *Urticaceæ*; Endlicher among his unsettled genera, without a remark. Moquin Tandon contents himself with excluding it from *Chenopods*. In an early edition of the present work this genus was absolutely placed among the Order of *Nettleworks*, with the remark that "*Batis* has a common urticaceous fruit, and it agrees with many genera of the Order in its embryo having the radicle turned down upon the cotyledons." This remark applied to the *Batis aurantiaca* of Wallich, which I had inadvertently assumed to belong to the genus in which that learned Botanist had placed it. I now find, however, that the shrubs called *Batis* by Roxburgh and Wallich belong to a totally different genus, allied to *Morus*, and therefore the remark now quoted falls to the ground. There is now no doubt that it belongs to the *Euphorbial* alliance, with which its diclinous flowers and compound free ovary undoubtedly unite it.

The salt marshes of the West Indies abound in this plant, which is sometimes gathered for the purpose of mixing with West Indian pickles. Its ashes yield barilla in abundance.

#### GENUS.

*Batis*, P. Br.

**NUMBERS.** GEN. 1. Sp. 2? (There is in Sir W. Hooker's Herbarium a Texan plant in too young a state for examination, but which may be a second species of *Batis*; and the plant figured in the former edition of this work had certainly a 6-celled, not 4-celled, ovary.)

Fig. CXCXVIII.—*Batis maritima*. 1. a ♂ cone; 2. a ♂ flower; 3. the same forced open to show the petals; 4. one of the bract scales; 5. a ♀ cone; 6. a perpendicular section of the same; 7. a ripe cone; 8. a section of it; 9. a seed; 10. an embryo.



ORDER XCIV. NEPENTHACEÆ.—Nepenthes.

Art. 14000. 1) *Nepenthes distillatoria* (L.) Hook. & Th. (Nepenthes) Ed. 1825. 2) *Nepenthes distillatoria* (L.) Hook. & Th. 1825. 3) *Nepenthes distillatoria* (L.) Hook. & Th. 1825.

DIAGNOSIS. *Nepenthes distillatoria* (L.) Hook. & Th. 1825. 1) *Nepenthes distillatoria* (L.) Hook. & Th. 1825. 2) *Nepenthes distillatoria* (L.) Hook. & Th. 1825. 3) *Nepenthes distillatoria* (L.) Hook. & Th. 1825.

Herbaceous or half-shrubby evergreen plants. Leaves alternate, slightly spreading at the base, with a dilated membranous petiole, pitcher-shaped at the end, which is articulated with a lid-like lamina. Stem without concentric zones, with an abundance of spiral vessels in the wood, pith, and bark, and also with a dense layer of the same between the wood and the bark. Racemes terminal, dense, many-flowered. Flowers dioecious. Calyx 4-lobed, imbricate, oppositely imbricated in aestivation. ♂ Stamens ordering in a small column, bearing at the apex about 10 anthers, collected in various directions in one head; anthers 2-celled, opening longitudinally and externally. ♀ Ovary free, trilocular, 4-celled, with an indefinite number of ascending ovals attached to the sides of the dissepiments; stigma sessile, simple. Fruit capsular, 4-celled, 4-valved, with the seeds sticking to the sides of the dissepiments, which proceed from the middle of the valves. Seeds indefinite, ascending, very minute, fusiform, with a lax outer integument; nucleus oblong, much less than the seed, lying about the middle of the outer integument, suspended by the chalaza; embryo in the midst of fleshy albumen, with 2 cotyledons placed face to face; radicle turned towards the hilum.

The relation that is borne by the highly curious plants which this Order contains was not even guessed at until Adolphe Brongniart pointed out a resemblance between them and Cistaceæ, which had not before been suspected, but which he considered so important as to justify him in placing the two Orders together. But it is impossible to agree in this conclusion. To say nothing of the extreme dissimilarity in habit between these plants, the structure of their fruit appears to be essentially different; and the seeds of *Cytinus* being unknown, the resemblance between it and *Nepenthes* is reduced to a similarity in the arrangement of the ovules, which may, not in the present case be considered as much important, as it is in many others, upon the unisexuality of the flowers in both genera. A better approximation of the Order has been made by Brown, who points out a relation to *Elæagnaceæ* in which the structure of the wood in some respects confirms his view. However, as that Order, it is needless, although plainly expressed, how it does this, we presume to characterise it, that the system of spiral vessels is developed in a degree common to any other plants. Eichler adds the same note to that of Brongniart and I



FIG. XCIX.

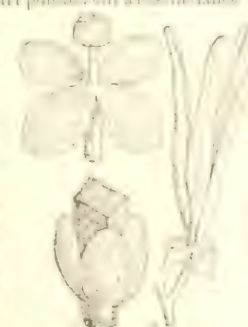


FIG. XCIX.—*Nepenthes distillatoria*. 1) ♂, 2) ♀, 3) fruit, 4) seed, 5) a section of the fruit showing the arrangement of the seeds.



have formerly coincided with those Botanists. But the adherent ovary of Birthworts, their highly developed calyx, axile placentation, and hermaphrodite flowers, are serious difficulties in the way of a close contact between them and Nepenths, unless the peculiar structure of the wood, the consideration of which I for the present abandon, should lead to the final establishment of the Class of Homogens, in which case Nepenths and Birthworts will be brought into contact, or at least a near neighbourhood. For the present, the true position of this Order must be regarded as an undetermined point. In the meanwhile it may be observed, that to station it in the Euphorbial Alliance will be to violate as few affinities as by taking any other course. Its points of agreements are its unisexual flowers, albuminous seeds, incomplete floral envelopes, and climbing habit. Its great disagreement consists in its indefinite seeds, and peculiar woody structure, which is, however, in some respects without example.

There is a good account of the germination of *Nepenthes*, in Jameson's Journal for April 1830, from which it may be concluded that the long loose tunic of the seed is intended to act at first as a buoy, to float the seed upon the surface of the water, and afterwards as an anchor, to keep it fast upon the mud until it can have struck root.

Natives of swamps in the East Indies and China.

Properties unknown. The water contained in the unopened pitcher of a plant which flowered in the Botanic Garden of Edinburgh, was found by Dr. Turner "to emit, while boiling, an odour like baked apples, from containing a trace of vegetable matter, and to yield minute crystals of superoxalate of potash on being slowly evaporated to dryness."

#### GENUS.

*Nepenthes*, L.

*Phyllamphora*, Lour.

NUMBERS. GEN. 1. Sp. 6 ?.

*Sarraceniaceæ* ?

POSITION.—*Euphorbiaceæ* ?.—NEPENTHACEÆ.—

*Aristolochiaceæ* ?

*Menispermaceæ* ?

In the *Verhandel, over de Natuurl. Geschied. Nederlandsche*, is a long Dutch dissertation by Korthals, which, I regret to say, I cannot read. He describes eight species, and figures good and copious details of the anatomy of the stem and of the fructification; from which it seems that the ovules are pendulous, with a very long tubular foramen, which eventually becomes one of the tails of the seed.



## ALLIANCE XXI. QUERNALES.—THE QUERNAL ALLIANCE.

DIAGNOSIS.—*Diclinous*, *Erypod*, with *unequalled* *crumpled* cotyledons, *7* *seeds*, an *inferior* *fruit*, and an *unperforated* *endosperm* without *albumen*.

The Alliance, which comprehends the common Oak and the Beech tree of Europe, is one whose limits are in no degree invaded. The truly diclinous epigynous flowers, the 7 of which are uniformly arranged in pairs, and the exalbuminous seeds with a large, unperforated embryo, offer marks of recognition not to be mistaken. That the Walnut is nearly allied to the Oak seems incontrovertible, although it is often placed in a very different part of the system. Its diclinous epigynous amentaceous flowers, and superior radicle, are entirely those of the Mastworts, and the crumpled cotyledons of *Juglans* Samson are an imitation of those of the Walnut itself. Indeed if the Walnut had a many-celled fruit and a cupule, there would be no very good reason for separating it from Mastworts, except its resinous juices.

At this point the Diclinous Sub-class touches the Perigynous, where the *Tortuosæ*, having in some instances diclinous flowers, as is the case with *Pistacia*, come up to the very limits of Juglands. On the other hand, the *Myrsinæ* in the Myrcal Alliance are not very different from hermaphrodite Mastworts, and establish a new class, but well-marked, approach on the part of the Epigynous Sub-class.

The transition from the Quernal Alliance seems to be formed by *Quercus* itself, whose flowers are so much like those of Juglands, although the habit is different, and if it were not for the minute embryo and large mass of albumen in *Quercus* it might take its place in the Quernal Alliance.

## NATURAL ORDERS OF QUERNALS.

<i>Querc.</i> 2- or more celled. <i>Ardis.</i> 1-celled or pulsat . . . . .	95. CORTICACEÆ
<i>Querc.</i> 1-celled. <i>Ardis.</i> solitary, erect . . . . .	96. JUGLANDACEÆ



## ORDER XCV. CORYLACEÆ.—MASTWORTS.

*Castaneæ*, *Adans. fam.* 366. (1763).—*Cupuliferæ*, *Rich. Anal. du Fr.* (1808); *Blume Flora Javæ*, *Endlich. lxxxix.*; *Meisner, p.* 346.—*Corylaceæ*, *Mirb. Elem.* 906. (1815).—*Quercineæ*, *Juss. in Dict. Sc. Nat. vol. 2. Suppl.* (1816).

**DIAGNOSIS.**—*Quernal Exogens*, with 2 or more cells in the ovary, and pendulous or peltate ovules.

Trees or shrubs. Leaves with stipules, alternate, simple, often with veins proceeding straight from the midrib to the margin. Flowers ♂ ♀; ♂ amentaceous, ♀ aggregate or amentaceous. ♂ Stamens 5 to 20, inserted into the base of scales or of a membranous valvate calyx, generally distinct. ♀ Ovary crowned

by the rudiments of an adherent calyx, seated within a coriaceous involucre (cupule) of various figure, with several cells and several ovules, the greater part of which are abortive; ovules twin or solitary, pendulous or peltate; stigmas several, sub-sessile, distinct. Fruit a bony or coriaceous 1-celled nut, more or less inclosed in the involucre. Seeds solitary, 1, 2, or 3; embryo large, with plano-convex fleshy cotyledons and a minute superior radicle.

The trees or bushes which constitute this Order are among the most important that are known in the Flora of Europe. They are readily recognised by their amentaceous flowers and peculiarly veined leaves; from all other plants they are distinguished by their apetalous superior rudimentary calyx, fruit inclosed in a peculiar

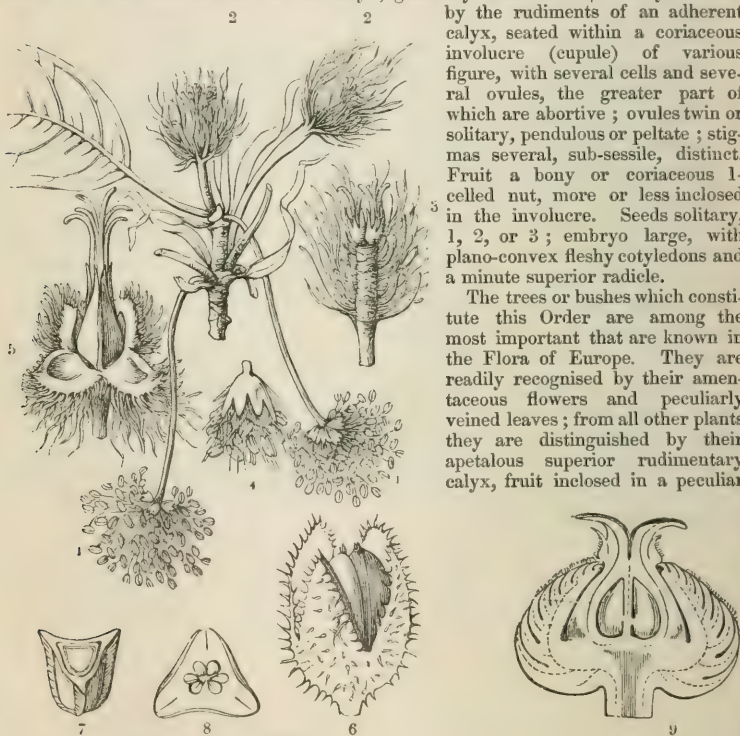


Fig. CC.

husk or cup, and nuts containing but 1 cell and 1 or 2 seeds, in consequence of the abortion of the remainder. They are akin to Willowworts and Birchworts, from which the superior calyx and, in the former case, very often the veining of their leaves, distinguish them. To Nettleworts they are nearly allied, but differ in their many-celled ovary, pendulous ovules, and superior calyx. At first sight, in consequence of their leaves never being pinnate, their relationship to Juglands escapes notice; but the discovery that some at least have the same kind of wrinkled and 4-lobed cotyledons, as for instance certain Oaks and *Synædryes*, has called attention to the fact. *Quercus Skinneri*, a kind of Oak from Guatemala, shows this in a striking manner; and upon considering all their points of structure, no doubt seems to remain about the Oak and Walnut really belonging to the same Natural Alliance.

Fig. CC.—*Fagus sylvatica*; 1. ♂ catkins; 2. ♀ do.; 3. the latter, with the scales of the involucre stripped off to show the ovaries at the apex; 4. a ♂ flower; 5. a half-grown ♀ with the involucre, now consisting of consolidated scales, forced back; 6. a ripe involucre opening and exposing the nuts; 7. a transverse section of a ripe nut; 8. the same of a young ovary (from *Nees*); 9. a vertical section of the ♀ flower of *Quercus pedunculata*.



Inhabitants of the forests of all the temperate parts of the continent both of the Old and New World; extremely common in Europe, Asia, and North America; trees are in Barbary and China, and the southern parts of South America, and common at the Cape. The species which are found within the tropics of either hemisphere are chiefly Oaks and Chestnuts, which abound in the high lands, but are unknown in the valleys of equatorial regions. The most southern genus is the Beech, of which many species occur in the lower parts of South America, and in Van Diemens Land, and New Zealand. Of the former, *Fagus procera* is said to be a larger tree than the *Armenica* itself, in whose country it grows wild.

An Order which comprehends the Oak, the Hazel Nut, the Beech, and the Spanish Chestnut, can scarcely require much to be said to a European reader of its properties, which are of too common a use to be unknown even to the most ignorant. Whatever excellence may be found in the timber of the European species is not at all inferior in that of hotter countries. Plume tells us that his *Lithocarpus javensis* is called *Passan-Batu*, or Stone-oak, because of its hardness. The leaves of *Quercus ilicata* are employed, on account of their astringency, externally in cases of gangrene; and the same astringent principle, which pervades all the Order, has caused them to be employed even as febrifuges, tonics, and stomachics. Cork is the bark of *Quercus Suber*; it contains a peculiar principle called Suberin, and an acid called the Suberic. The galls that writing ink is prepared from are the produce of the *Quercus infectoria*, from which they derive their astringency. The acorns of a species now

in the Levant under the name of *Volonia* (*Quercus Agilops*) are distinguished for the use of dyers. The fixed acids, called *Quercitanic* and *Galic*, which have the power of bleaching animal and vegetable fibre from decay, are abundant in many of the *Querc.* whose bark is therefore invaluable for tanning. The yellow dyeing bark, called *Quercitron*, is ascribed to *Q. tinctoria*. The husks of the common Beech-tree yield a resinous excretion, called *Fagine*. The sweetness of Spanish Chestnuts and *Filix* is not confined to the nuts of those trees; the other species of *Castanea* and *Corylus* resemble them in this respect, as do the Beech and many sorts of Oak, especially *Q. pyramidalis*, whose acorns are the *Belotes* of Spain, and a variety of *Q. sessiliflora*, which is believed to be the *Aesculus* of Virgil. The bark of the Oak has been employed as a vomit and a febrifuge. In hot weather a large quantity of saccharine matter is exuded from the leaves of *Q. mauniflora*, in Koosistan, where it is made into confections. Oil is obtained from the seeds of some species, such as the *Black* and *Hazel* nut.



1000

## C. J. NERBA

<i>Cipetius, L.</i>	<i>Favos, L.</i>	<i>Curtius, Quinct.</i>	<i>L. Curtius, Quinct.</i>
<i>Ostrya, S. p.</i>	<i>Calceolarius, H. &amp; J.</i>	<i>Quintus, L.</i>	<i>Quintus, L.</i>
<i>Corylus, L.</i>	<i>Calyptomys, H. &amp; J.</i>	<i>Ilia, Quinct.</i>	<i>Ilia, Quinct.</i>
<i>N. Quinctus, L.</i>			
<i>Dist. Quinctus, L.</i>			

1. 1. 1.

1987, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 26

Postscript.—*Inglandia*.—*Chrysol.*—*L.*—

*J. H. H. H. H.*

The CCL-1A,  $\alpha$ , and  $\beta$  subunits of Quantum S (shown) are shown, the lobed entities



## ORDER XCVI. JUGLANDACEÆ.—JUGLANDS.

Juglandæ, *D.C. Theorie*, 215. (1813); *Kunth. in Ann. Sc. Nat.* 2. 343; *Blume, Fl. Jav.*; *Bartl. Ord. Nat.* 397.; *Endlich. cexliv.*

DIAGNOSIS.—*Quernal Exogens, with 1 cell in the ovary, and 1 solitary erect ovule.*

Trees, with a watery or resinous juice. Leaves alternate, pinnated, usually undotted. Stipules none. Flowers herbaceous, inconspicuous. Flowers imperfect, ♂ ♀; the ♂ in catkins, the ♀ in terminal clusters; occasionally both mingled in 1 panicle. ♂ Calyx adherent to a scale-like bract, 2-3-6-parted, with membranous unequal segments. Stamens 3, or a considerable number, with short free filaments and erect 2-celled anthers. ♀ either terminal, clustered, and surrounded with a few small bracts of the bud, or in loose racemes inclosed in a 1-flowered involucre, which is cup-shaped at the base, united with the base of the calyx, growing with its growth, and finally acquiring unequal wing-like expansions. Calyx adherent to the ovary, with a minute limb, in from 3 to 5 deciduous or shrivelling divisions. Corolla usually 0, occasionally minute petals. Ovary adherent, 2- or 4-celled at the base, 1-celled at the apex, with a short column on which the ovule is seated. Ovule solitary, erect, on the point of the central column, orthotropal. Styles 1 or 2, very short; stigmas 2-4, seldom more, and unequal, fringed; sometimes sessile, discoid, 4-lobed. Drupe 1-stoned, naked, or in an adherent involucre; with the sarcocarp usually separating from a 2-valved or valveless stone, which is 2-4-celled at the base and 1-celled at the apex. Seed erect, without albumen, smooth or wrinkled, 2- or 4-lobed at the base, and partly divided by partial dissepiments which cut into it. Cotyledons fleshy, oily, sinuous. Radicle very short, superior.

Almost everybody refers these fine trees to the neighbourhood of the plants called Terebints by Jussieu; to which, however, their affinity is obscure. On the contrary, with the single exception of their terebinthinous leaves, all the points of their structure seem to point to Mastworts, with which they accord in their unisexual flowers, adherent calyx, and large exalbuminous embryo, which in *Synædryx* and some Oaks is also 4-lobed and wrinkled. This too seems to be the opinion of M. Adrien de Jussieu (*Cours élémentaire*, p. 510). Endlicher, however, still regards them as related to the Terebints through *Pistacia*, and there is no doubt that they are so, although, as has been already stated (p. 289), they seem to have a nearer resemblance to Mastworts.

Chiefly found in North America; a few are East Indian; one species, the common Walnut, is a native of Persia and Cashmere; another, of Caucasus; and a third, of the West India Islands.

The bark is acrid and purgative: so is the rind of the fruit of the common Walnut, notwithstanding its astringency. This quality is not confined to *J. regia*, but gives its name to the *J. cathartica* of the United States. The seed of the Walnut is esteemed for its sweetness and wholesome qualities. It abounds in oil, of a very drying nature, and valuable for domestic purposes. Mr. Vigne says that above 12,000 ass loads of Walnut kernels are annually appropriated to the oil press in Cashmere, where Walnut oil is preferred to Linseed oil, and is chiefly employed in cookery and for burning in lamps. This oil possesses such qualities as fairly entitle it to introduction into Europe, and if divested of its mucilage, it might, perhaps, compete with oil of Olives, at least for medi-

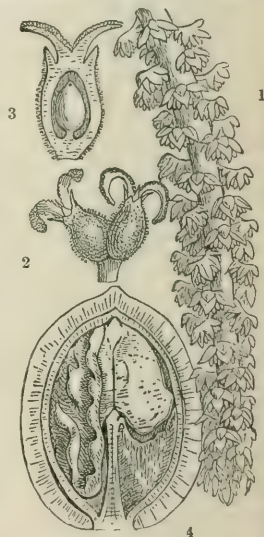


Fig. CCII.

Fig. CCII.—*Juglans regia*; 1. a ♂ catkin; 2. a pair of ♀ flowers; 3. perpendicular section of a ♀ flower; 4. perpendicular section of a ripe Walnut.



cial purposes. The fruit of several kinds of Hickory is eaten in America. The kernel of all is valuable; that of *J. regia* and *carya* for its rich, strong, smooth, unpolished, and that of *Carya alba*, the common Hickory, for its elasticity and toughness. The seeds of *Carya amara* are too bitter to be eaten, but, combined with oil of olive-mill, are found useful in sores. The *Ficus indutina* are very common in the species of large Java tree, as much as 200 feet high, has a pale brown smooth bark and hairy, and used in Java for cart wheels, which are cut out of a single horizontal slice.

## GENERA.

*Juglans*, L.  
*Carya*, Nutt.  
*Hicoria*, Bats.  
*Prescottia*, Nutt.

*Engelhardtia*, Benth.  
*Platanus*, Benth.  
*Simarouba*, Benth.  
*Simarouba*, Benth.  
*Simarouba*, Benth.

NUMBERS. GEN. 4. Sp. 27.

*Amorpha*, L.

POSITION. — *JUGLANDACEÆ* — *Carya*, L.  
*Gossypium*, L.



FIG. CCII.

FIG. CCII. 1. — *Platanus*, Benth. 2. — *Simarouba*, Benth. 3. — *Simarouba*, Benth. 4. — *Simarouba*, Benth.



ALLIANCE XXII. *GARRYALES*.—THE GARRYAL ALLIANCE.

DIAGNOSIS.—*Diclinous Exogens*, with *monochlamydeous*, sometimes *amentaceous*, flowers, an *inferior fruit*, and a *minute embryo lying in a large quantity of albumen*.

If we consider this Alliance conterminous with the Quernal on the one hand, because of the approach by *Garrya* to *Juglans*, so on the other must it stand in near relation to the Euphorbial, in consequence of including *Helwingia*, which may be considered as being almost a Spurge wort with an inferior ovary. It appears however to be sufficiently limited by its minute embryo, copious albumen, inferior ovary, and diclinous flowers. The former of these circumstances brings it near the Menispermal Alliance, in which alone among Diclinous Orders does this peculiar embryo occur.

*Helwingia* has a lateral relation to Sandalworts (*Santalaceæ*), in the Epigynous Sub-class

## NATURAL ORDERS OF GARRYALS.

- |   |               |               |
|---|---------------|---------------|
| <i>Flowers amentaceous. Leaves opposite, exstipulate.</i> | . . . . . 97. | GARRYACEÆ.    |
| <i>Flowers fascicled. Leaves alternate, stipulate.</i>    | . . . . . 98. | HELWINGIACEÆ. |



## ORDER XCVII. GARRYACEÆ.—GARRYALES.

*Garrya*, *Leuc. et Bot. Beech*, 29 t. 1686. (*Engl. Bot.*, *Flora*, p. 206. *Atlas*, p. 206.)

DIAGNOSIS.—*Opposite leaves*, with *concentric stomata*, and *oppositely lower, without stipules*.

Shrubs. Leaves opposite, without stipules. Flowers arranged in panicle-like racemose racemes, within connate bracts. Wood without distinct concentric zones, or dotted ducts. Flowers unisexual, amictuous. 1. Sepals 4. Stamens 5, adherent to the sepals, not clasp. 2. Calyx superior, two-lobed. Ovary one-celled; styles 2, setaceous; sessile, pubescent, with filaments as long as themselves. Pericarp beaked, indehiscent, two-celled. Embryo very minute in the base of fleshy albumen.

In its amictuousness, imperfect flowers, superior calyx, and mode of germination, the tree is similar to *Mastixia*, from which it differs most essentially in its wood without concentric zones or vascular tissue (dotted vessels), its opposite exstipulate leaves, simple fruit, and minute embryo lying in a great mass of albumen. The latter characters bring it near *Propon* and their allies, especially *Chloranthus*, with which its zoneless wood (for *Chloranthus* has no stunted zones), simple fruit, and opposite leaves, also agree; but the stipules of *Chloranthus*, together with their naked flowered flowers, and articulated stems, distinctly separate that Order. Nettleworts and Antidesmads may also be compared with *Garrya* on account of their imperfect unisexual flowers, somewhat amictuous inflorescence, and simple fruit; but their superior fruit, alternate leaves, and more perfectly formed wood, are important points of difference. Cuscuta again may be taken into comparison on account of its opposite exstipulate leaves, amictuous unisexual flowers appearing from the axils of opposite leaves, minute embryo lying in a great mass of albumen, and imperfect zoneless wood, which in both cases is chiefly constituted of woody fibre (the cells of which are marked with pappaceous brownish granules), and of smaller and reticulated vessels lying in scattered spirals traversing the tubes of woody fibre. On the other hand, these plants have entirely the appearance of *Viburnum* or *Hamamelis*, in which Enlicher follows, placing it among the woods, in which Enlicher follows, placing it among the woods, in which Enlicher follows, placing it among the woods.

**Julifloræ.** Its adherent calyx, however, and more complicated fruit, which an opportunity of associating it with *Helwingiads*, which agree in having a minute embryo in the base of solid albumen, and bring the whole into immediate contact with the *Epilobium* Alliance.

These shrubs are all found in North America, in temperate latitudes, up to the West Indies.

Their uses are unknown.

## GENERA.

*Garrya*, *Desfont.*  
*Propon*, *Florb.*

NUMBERS. GEN. 2. SP. 2.

POSITION.

*Aspidodermis*.  
GARRYACEÆ.—*Hamamelidaceæ*.  
*Epilobium*.

FIG. CCH. — *Garrya elliptica*. 1 a ♀ flower; 2 a ♂; 3, a dissected section of the ovary; 4, a section of the seed.



## ORDER XCVIII. HELWINGIACEÆ.—HELWINGIADS.

Helwingiaceæ, *Decaisne*, *Ann. Sc. Nat.* 2. ser. 6. 69. (1836); *Endl.* p. 328.

DIAGNOSIS.—*Garryal Exogens*, with fascicled flowers, and alternate leaves with stipules.

A shrub. Leaves alternate, serrate, without deciduous stipules. Flowers fascicled on the midrib of the leaves. Flowers unisexual. Calyx simple, 3-4-parted, with ovate spreading segments, which are deciduous in the females; æstivation valvate. ♂ Stamens 3-4, alternate with the sepals. Anthers continuous, roundish, turned inwards, 2-celled. Pollen smooth. ♀ Ovary adherent to the calyx, crowned by an epigynous disk, 3-4-celled, with one ovule in each cell. Ovules pendulous from the inner angles, anatropal. Style very short. Stigmas 3-4, short, awl-shaped, diverging. Drupe surmounted by the remains of the styles and disk, 3- or 4-celled, scarcely dehiscent (at last loculicidal, *Sieb.*); the cocci one-seeded. Seeds suspended by a short cord. Embryo minute, in the end of solid fleshy albumen; radicle superior.

Although this Order appears to be composed at present of only a single genus, yet it is one of those obscure apetalous unisexual plants, of which few have yet engaged the attention of Botanists, and it is almost sure to find companions hereafter; and even in the absence of this probability, its characters are so well marked as to justify its establishment. *M. Decaisne* seems inclined to refer it to the neighbourhood of *Witch-hazels*, rather than to that of *Spurge-worts*, with which he, however, compares it. But on the one hand, the minute embryo and unisexual flowers remove it far from the former Order; and again, its inferior fruit, unisexuality, and seeds, bring it near to *Garryads*, with which it seems more fit to be associated. With the *Santalaceous* Order, to which it has been referred, it has an indirect affinity, as is shown by its inferior fruit, small embryo, valvate calyx, and definite stamens.

The only known species inhabits Japan.

The mountaineers of Japan employ the young leaves of *Helwingia rusciflora* as an esculent vegetable.—*Siebold*.

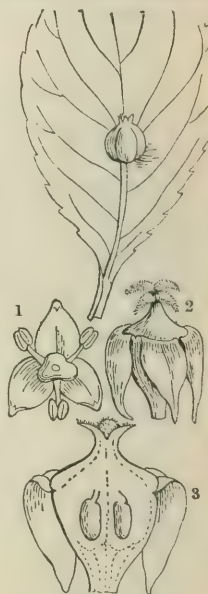


Fig. CCIV.

## GENUS.

*Helwingia*, *Willd.* *Quadriala*, *Zucc.*

## NUMBERS. GEN. 1. Sp. 1.

*Euphorbiaceæ.*

POSITION. ——— *HELWINGIACEÆ.*—*Garryaceæ.*

*Santalaceæ.*

Fig. CCIV.—*Helwingia ruscifolia*.—*Siebold*. 1. a ♂ flower; 2. a ♀; 3. a perpendicular section of the latter.



## ALLIANCE XXIII. MENISPERMACEÆ.—THE MENOCHORACEÆ.

DIAGNOSIS.—*Albumen Firmum*; with rounded cotyledons, thin, or, sometimes, somewhat cartilag., and not endospermous, but a large, solid albumen.

This Alliance stands in the same relation to others in the Dilleniaceæ as it does to the Hypericaceæ, or Rosaceæ to the Ternstroemiaceæ. Its essentiality requires roads in the disunited carpels, abundant albumen, and trimerous flowers. In the Alliances just mentioned, the carpels are sometimes reduced to unity, and the same circumstance occurs in the present instance, where most of the Nutmegs are essentially simple in their carpellary structure; but in such instances are regarded as exceptional in Ranads and Rosads, being unaccompanied by other points of affinity. In the Nutmegs the same conclusion must be adopted, the more especially since *Hyalostemma*, which I regard as a genuine genus of the Order, possesses more carpels than any of the habitual character.

The relation of the Orders now collected in the same Alliance will hardly be denied. Their combining characters are apparently solid, and their passage from one to the other sufficiently well marked. Plume Nutmegs and Monimiads are by some Botanists regarded as the same Order; Monimiads pass into true Nutmegs by means of *Vetivertone*, and the remarkable peculiarity observable in the thin divergent cotyledons of the embryo is common to both Orders. Nutmegs are brought into contact with Menispermads by their trimerous flowers, and by the ruminated albumen of *Anomospermum*; finally, the strict relation of Menispermads, Kadsurads, and Lardizabaceæ is undeniable.

In its external relations this Alliance is very remarkable. In its form, its smell, habit and unisexual flowers so nearly approach those of Cucurbits in some instances, that even so acute a Botanist as Dr. Blume has referred the genus *Gynostemma* to the Cucurbit, to the Order of Menispermads. To the Ranal Alliance it passes directly by means of the genus *Hyalostemma*, which will be regarded as a Nutmeg, or an *Anomospermum*, according to the different points of view in which the question of affinity is treated. And even to Dietygens it cannot but be regarded as a near approach, if we compare the trimerous Menispermads with *Smilax*.

## NATURAL ORDERS OF MENISPERMACEÆ.

<i>Albumen copious, solid.</i> Seeds pendulous; cotyled. small; . . . . .	100 Menispermaceæ
<i>internal.</i> <i>Stemum hypogæum</i> . . . . .	
<i>Albumen copious, solid.</i> Seeds solid. <i>Albumen</i> copious; . . . . .	100 Apocynaceæ
<i>internal</i> . . . . .	
<i>Albumen copious, ruminated.</i> Syllimnoid, with a large . . . . .	100 Menispermaceæ
<i>Albumen copious, solid.</i> Syllimnoid, with a large . . . . .	100 Menispermaceæ
<i>Albumen copious, solid.</i> Seeds pendulous; cotyled. small; . . . . .	100 Apocynaceæ
<i>internal.</i> <i>Stemum hypogæum</i> . . . . .	
<i>Albumen sparse, solid.</i> Seeds copious; cotyled. . . . .	100 Apocynaceæ



## ORDER XCIX. MONIMIACEÆ.—MONIMIADS.

Monimieæ, *Juss. in Ann. Mus.* 14. 130. (1809); *Bartl. Ord. Nat.* 103.; *Endl. Gen. cv.*

DIAGNOSIS.—*Menispermal Exogens, with perigynous stamens, pendulous seeds, and a minute embryo on the outside of copious fleshy albumen.*

Aromatic trees or shrubs. Leaves opposite, without stipules. Flowers axillary, ♂ ♀. Calyx somewhat globose, divided at the border, sometimes into more rows than one, in which case the segments of the latter are petaloid and imbricated. ♂ Stamens indefinite, covering all the inside of the tube of the calyx; filaments often with a pair of scales at the base; anthers 2-celled, bursting longitudinally. ♀ Ovaries several, superior, 1-celled, distinct, inclosed within the tube of the calyx, each with its own style and stigma; ovule solitary, anatropal, pendulous. Fruit consisting of several 1-seeded nuts, inclosed within the enlarged calyx. Seed pendulous; embryo [small, at the end of an abundant fleshy albumen, to which it is wholly external, its thin diverging cotyledons being applied to the surface of the albumen; testa very fleshy; radicle superior in *Ruizia fragrans* or *Boldoa*].

The plants which constitute this Natural Order have been stationed by different Botanists in various parts of their Natural arrangements. Being shrubs with apetalous flowers and an aromatic quality, they have been placed near Laurels (*Lauraceæ*), with which they also correspond in their ovaries containing but one ovule. Their flowers being apetalous and the sexes disunited, others have referred them to the vicinity of Nettleworts (*Urticacæ*), with which, moreover, some species of *Citrosma* correspond in habit. The true station, however, is evidently among unisexual Orders, with a very large quantity of albumen, where they may be very naturally associated with Nutmegs and their allies. In fact, Mr. Gardner's *Tetratome elliptica* has so much the appearance of a Nutmeg, that it has been laid into herbaria as such. The extremely aromatic quality of these Monimiads is a strong confirmation of the propriety of this view. Their numerous carpels bring them also into contact with *Kadsurads*, another aromatic Order. The structure of the calyx of *Boldoa*, the gradual transition of its segments into petaloid leaves, and the disunited carpels, indicate some analogy to *Calycanthis*, but the minute embryo and disunited sexes forbid us to regard the connection between these plants and Monimiads as being of an intimate kind.

Brown says (*Flinders*, 553.) that what is here called, with Jussieu, a calyx, is more properly an involucre; a view that I formerly adopted, not having had the opportunity of examining specimens for myself. Now, however, that good materials have been acquired by me, I no longer concur with him in that opinion.

In most books the embryo is said to be in the axis of fleshy albumen. How far this may be true in other genera I am unable to ascertain, but it is certainly not so in *Boldoa fragrans*; which, as was partly stated long ago by Correa de Serra, has the very curious structure above described. Is it possible that the thick fleshy radicle has been taken for an embryo, and that the thin diverging cotyledons have been overlooked?



2 Fig. CCV.







## ORDER C. ATHEROSPERMACEÆ.—PLUME NUTMEGS.

*Atherospermeæ*, R. Brown in *Flinders*, 553. (1814); *Arnott in Edinb. Encycl.* 130.

DIAGNOSIS.—*Menispermæ* *Ecogens*, with anthers opening by recurved valves.

Trees. Leaves opposite, without stipules. Flowers axillary in short racemes, with large deciduous bracts, ♂ ♀ (or ♂). Calyx

tubular, divided at the top into several segments, usually placed in two rows, the inner of which is partly petaloid; to these are superadded in the ♀ flowers some abortive stamens in the form of scales. Stamens in the ♂ very numerous in the bottom of the calyx; in the ♀ fewer, and arising from the orifice of the calyx; anthers adnate, 2-celled, bursting with a valve which separates from the base to the apex; filaments with a pair of scales at their base. Ovaries several, usually indefinite, each with a single erect ovule; styles simple, arising either from the side or the base; stigmas simple. Nuts inclosed in the tube of the calyx, with the adherent styles converted into feathery awns. Seed solitary, erect; embryo minute, erect, at the base of soft fleshy albumen, with divaricating cotyledons; radicle inferior.

Although the anthers of this Order are the same as those of Laurels and Berberries, and notwithstanding that it agrees with the former in its aromatic odour, yet it seems to stand in the

Fig. CCVII.

nearest relationship to Monimiads, with which it is even combined by Jussieu, Bartling, and Endlicher. It differs, however, in the position of the ovule, and the structure of the anthers, and is probably a nucleus around which other genera will be hereafter collected.

The Australian continent produces two of the genera; *Laurelia* belongs to Chile.

All the species seem to be fragrant. The wood of *Doryphora* *Sassafras*, called *Sassafras* in New Holland, is said to smell like Fennel. The nuts of *Laurelia* are described as possessing the fragrance of the Nutmeg. Mr. Backhouse gives the following account of *Atherosperma moschata*. "This forms a very beautiful tree in many parts of the colony, attaining to a height of 150 feet, and is from 6 to 7 feet in circumference. Its mode of growth resembles many *Coniferae*, in being conical, and in having all its branches of the same year's growth, radiating from one point on the trunk. A decoction of the bark, either when in its green state or after having been dried, is used in many remote parts of the colony as a substitute for tea, and, when taken with plenty of milk, has a pleasant taste. Its effects are, however, slightly aperient."



Fig. CCVIII.

GENERA.

*Atherosperma*, Labill.

*Laurelia*, Juss.

*Pavonia*, Ruiz.

*Thiga*, Molina.

*Doryphora*, Endl.

NUMBERS. GEN. 3. Sp. 4.

*Lauraceæ*.

POSITION.—*Monimiaceæ*.—ATHEROSPERMACEÆ.—*Myristicaceæ*.

*Calycanthaceæ*.

Fig. CCVII.—*Atherosperma moschata*.

Fig. CCVIII.—1. carpel; 2. stamen of *Doryphora Sassafras*.—Endlicher.

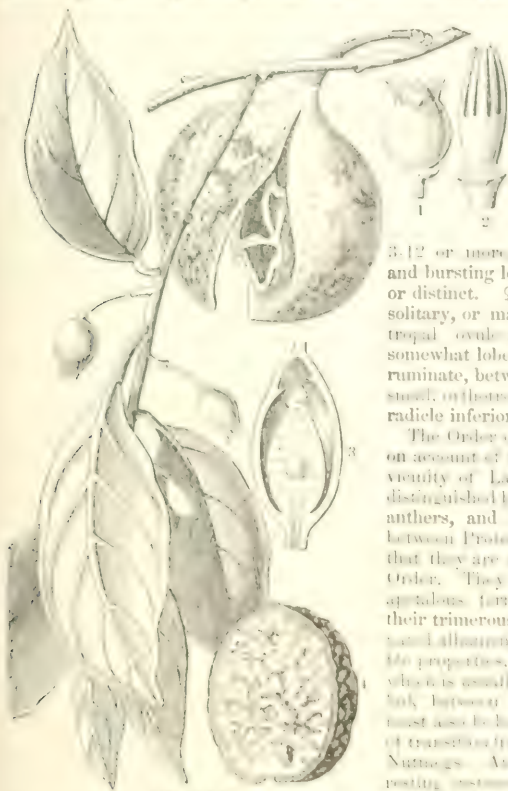


## ORDER CL MYRISTICACEAE. N. CHAMBERS

Myatsumori, K. *Hosoya, T.* (eds.), 1981, *Proceedings of the 244th Meeting of the Japanese Association of Geologists*, pp. 37-47. Tokai University Press, Tokyo, 1981. (In Japanese, English summary.)

DIAGNOSIS. *M. n. n.* (f. *L. n. n.*) and *radiata* differ only a point, a point of color.

Tropical trees, often yielding a red juice. Leaves alternate, without stipules, not dotted, quite entire, stalked, coriaceous. Inflorescences axillary or terminal, racemose.



100

an involucred *Myristica* if it had an aril. That plant, which has increased in height to 100 feet, and has flowers, and a trifid calyx surrounded by an involucre of six imbricate bracts, was regarded as a *Uvaria* by Roxburgh, and may be justly enough regarded as *Myristica*, if its numerous carpels are considered, or *Myristicium*, if the numerous downy and simple trifid calyx are allowed to have weight.

While, however, all these relationships may be observed among the angiosperms, it seems impossible to disjoin Nuttalls from the Mimosoideae and Affines because of their strictly bisexual flowers. The diverging cotyledons of their embryo (Young 1936) are Mimosoideae, while the ramifoliate allanett birds its parallel in the species *Artemisia* in Mimosoideae. (S. p. 1936).

The CGN = Myristicifurcata-Bilimbia 1 + Bilimbia 2 is a series of stages. The number of stages is 2, showing the early and early-late a section of a section with the surface of the stage 1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47/48/49/50/51/52/53/54/55/56/57/58/59/60/61/62/63/64/65/66/67/68/69/70/71/72/73/74/75/76/77/78/79/80/81/82/83/84/85/86/87/88/89/90/91/92/93/94/95/96/97/98/99/100/101/102/103/104/105/106/107/108/109/110/111/112/113/114/115/116/117/118/119/120/121/122/123/124/125/126/127/128/129/130/131/132/133/134/135/136/137/138/139/140/141/142/143/144/145/146/147/148/149/150/151/152/153/154/155/156/157/158/159/160/161/162/163/164/165/166/167/168/169/170/171/172/173/174/175/176/177/178/179/180/181/182/183/184/185/186/187/188/189/190/191/192/193/194/195/196/197/198/199/200/201/202/203/204/205/206/207/208/209/210/211/212/213/214/215/216/217/218/219/220/221/222/223/224/225/226/227/228/229/230/231/232/233/234/235/236/237/238/239/240/241/242/243/244/245/246/247/248/249/250/251/252/253/254/255/256/257/258/259/260/261/262/263/264/265/266/267/268/269/270/271/272/273/274/275/276/277/278/279/280/281/282/283/284/285/286/287/288/289/290/291/292/293/294/295/296/297/298/299/300/301/302/303/304/305/306/307/308/309/310/311/312/313/314/315/316/317/318/319/320/321/322/323/324/325/326/327/328/329/330/331/332/333/334/335/336/337/338/339/340/341/342/343/344/345/346/347/348/349/350/351/352/353/354/355/356/357/358/359/360/361/362/363/364/365/366/367/368/369/370/371/372/373/374/375/376/377/378/379/380/381/382/383/384/385/386/387/388/389/390/391/392/393/394/395/396/397/398/399/400/401/402/403/404/405/406/407/408/409/410/411/412/413/414/415/416/417/418/419/420/421/422/423/424/425/426/427/428/429/430/431/432/433/434/435/436/437/438/439/440/441/442/443/444/445/446/447/448/449/450/451/452/453/454/455/456/457/458/459/460/461/462/463/464/465/466/467/468/469/470/471/472/473/474/475/476/477/478/479/480/481/482/483/484/485/486/487/488/489/490/491/492/493/494/495/496/497/498/499/500/501/502/503/504/505/506/507/508/509/510/511/512/513/514/515/516/517/518/519/520/521/522/523/524/525/526/527/528/529/530/531/532/533/534/535/536/537/538/539/540/541/542/543/544/545/546/547/548/549/550/551/552/553/554/555/556/557/558/559/560/561/562/563/564/565/566/567/568/569/570/571/572/573/574/575/576/577/578/579/580/581/582/583/584/585/586/587/588/589/590/591/592/593/594/595/596/597/598/599/600/601/602/603/604/605/606/607/608/609/610/611/612/613/614/615/616/617/618/619/620/621/622/623/624/625/626/627/628/629/630/631/632/633/634/635/636/637/638/639/640/641/642/643/644/645/646/647/648/649/650/651/652/653/654/655/656/657/658/659/660/661/662/663/664/665/666/667/668/669/670/671/672/673/674/675/676/677/678/679/680/681/682/683/684/685/686/687/688/689/690/691/692/693/694/695/696/697/698/699/700/701/702/703/704/705/706/707/708/709/710/711/712/713/714/715/716/717/718/719/720/721/722/723/724/725/726/727/728/729/730/731/732/733/734/735/736/737/738/739/740/741/742/743/744/745/746/747/748/749/750/751/752/753/754/755/756/757/758/759/760/761/762/763/764/765/766/767/768/769/770/771/772/773/774/775/776/777/778/779/780/781/782/783/784/785/786/787/788/789/790/791/792/793/794/795/796/797/798/799/800/801/802/803/804/805/806/807/808/809/810/811/812/813/814/815/816/817/818/819/820/821/822/823/824/825/826/827/828/829/830/831/832/833/834/835/836/837/838/839/840/841/842/843/844/845/846/847/848/849/850/851/852/853/854/855/856/857/858/859/860/861/862/863/864/865/866/867/868/869/870/871/872/873/874/875/876/877/878/879/880/881/882/883/884/885/886/887/888/889/890/891/892/893/894/895/896/897/898/899/900/901/902/903/904/905/906/907/908/909/910/911/912/913/914/915/916/917/918/919/920/921/922/923/924/925/926/927/928/929/930/931/932/933/934/935/936/937/938/939/940/941/942/943/944/945/946/947/948/949/950/951/952/953/954/955/956/957/958/959/960/961/962/963/964/965/966/967/968/969/970/971/972/973/974/975/976/977/978/979/980/981/982/983/984/985/986/987/988/989/990/991/992/993/994/995/996/997/998/999/1000/1001/1002/1003/1004/1005/1006/1007/1008/1009/1010/1011/1012/1013/1014/1015/1016/1017/1018/1019/1020/1021/1022/1023/1024/1025/1026/1027/1028/1029/10



Natives exclusively of the tropics of India and America, and most common in the former.

Their bark abounds in an acrid juice, which is viscid and stains red; the rind of the fruit is caustic. The aril and albumen of *Myristica moschata*, the former known under the name of Mace, and the latter of Nutmeg, are important aromatics. An aromatic fruit is also borne by other species. The coarse, strong-smelling Nutmegs of Santa Fé are from the *Myristica Otoba*. Another species is the *M. tomentosa*, and a third the *M. officinalis*, which is reckoned in Brazil an energetic tonic. In the Indian Archipelago *Myristica spuria* is employed as a substitute, and also a species in the Philippines called Dooghan, Dungan, or Gonogono; in Madagascar, *M. acuminata* and madagascariensis, and in Brazil *M. Bicuiba* (*Bicuiba* or *Vicuiba*) or *officinalis*. The seeds also abound in oil. *Viola sebifera* yields a fatty oil upon simple immersion in hot water; the common Nutmeg furnishes a similar secretion, and also a fluid oil. From the white Mace of *M. Otoba* is prepared an ointment used against the itch in Colombia. The red Mace of *Pyrrhosa tingens*, an Amboyna plant, when rubbed between the fingers is mucilaginous, and stains them fiery red; by the addition of lime it yields a red pigment, with which the natives stain their teeth.—*Blume*. The aromatic quality, although so common in this Order, sometimes deserts their fruit. In *Myristica fatua* the fragrance is very slight and soon disappears, and in others it is scarcely perceptible. It must, however, not be supposed that the insipid Nutmegs are inert. Mr. Hinds states that in New Guinea, where the latter are common, persons who ate as many as two were soon after surprised by a violent evacuation of the bowels, and disturbance of the stomach. A single one produced nausea, sensation of fullness, and flatus.—*Lond. Journ. Bot.* 1. 675. This corresponds with the qualities of the common Nutmeg, which can only be used safely in very small quantities; in excess it produces oppression of the chest, intense thirst, headache, and even delirium and fatal apoplexy.—*Endl.* The Dungan of the Philippines, already mentioned, yields a crimson juice which is collected from incisions in the trunk, and used as a substitute for Dragon's Blood.—*Endl.* See *Blume's Rumphia*, 1. p. 179.

#### GENERA.

*Myristica*, Linn.  
*Viola*, Aubl.  
*Scophora*, Neck.  
*Knema*, Lour.  
*Pyrrhosa*, Blum.  
*Horsfieldia*, Willd.  
*Hyalostemma*, Wall.

NUMBERS. GEN. 5. Sp. 35?

*Anonaceæ.*

POSITION.—Schizandraceæ.—MYRISTICACEÆ.—Menispermaceæ.

*Euphorbiaceæ.*







fruits used by the same people as an emollient medicine. — *1b.* The branches of *Lardizabala* are extremely tough, and are employed as cordage in Chile, by merely passing them through fire and then leaving them for some hours in water. — *Decaisne.* According to Thouars, the fruit of the doubtful genus *Burasaia* abounds in mucilage.

GENERA.

§ 1. MADAGASCAR.

*Burasaia*, *Thouars.*

§ 2. ASIATIC.

*Akebia*, *DC.*

*Holboellia*, *Wall.*

*Stauntonia*, *DC.*

*Parvattia*, *DC.*

§ 3. AMERICAN.

*Lardizabala*, *Ruiz et Pav.*

*Boissiera*, *Domb.*

*Thauninia*, *Domb.*

*Boquila*, *DC.*

NUMBERS. GEN. 7. Sp. 15.

*Anonaceæ.*

POSITION.—Schizandraceæ.—LARDIZABALACEÆ.—Menispermaceæ.

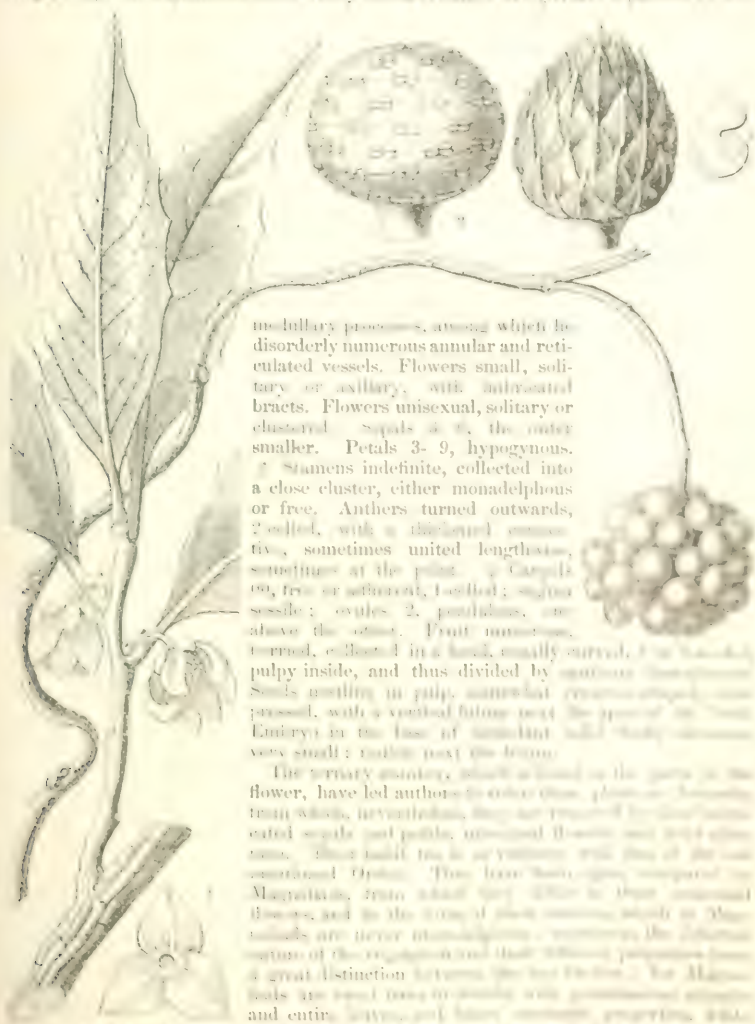
*Berberidaceæ.*



O. CHL. SCHIZANDRACEAE. *B. Kalm.* 1769.

**DISCUSSION**—*Mugiliformis* E. Jørgensen, with *Lepidogobius* occurring, possibly as well, and distinct species, included by Jørgensen based on similar

Scrambling shrubs. Leaves alternate, simple, entire or toothed, pubes-  
cent, often with polliniferous dots. Wood (in *Sphaerostoma purpurascens*) without  
nodes, composed of glandular-scaled woody tubes, arranged in rows, and separated by 2



100

the inflorescence, axillary, which become disorderly numerous annular and reticulated vessels. Flowers small, solitary or axillary, with imbricated bracts. Flowers unisexual, solitary or clustered. Sepals 5-7, the outer smaller. Petals 3-9, hypogynous.

Stamens indefinite, collected into a close cluster, either monadelphous or free. Anthers turned outwards, 2-celled, with a dilated connective, sometimes united lengthwise, sometimes at the point. Carpel 100, free or subfree, 1-celled; septa sessile; ovules 2, pendulous, one above the other. Fruit numerous, turned, 2-lobed in a head, usually a pulpy inside, and thus divided by seeds resting in pulp, somewhat compressed, 1, with a ventral furrow next to embryo; in the base of seed that view small; rather next one to the

The primary anatomy which is found in the parts of the flower, have led authors to order them *phloeo* or according to their whorls, *perigonothales*, they are treated by the same order, seeds and petals, unopened flowers and seed capsules. Thus built the is an outline with one of the last mentioned Order. These four have been compared to Magnoliids, from which they differ in their unopened flowers, and in the form of their ovules, while in Magnoliids are never intraxial, whereas the former system of the ovulation and their different position form a great distinction between the two Orders. For Magnoliids are most found in double and gemmulate ovules and entire leaves, and have common germination, while the other form bears only one fruit, rarely, sometimes



of stipules, constantly having toothed leaves, but having no aromatic or bitter properties; on the contrary, they abound in vegetable mucus. It is near Menispermads that they seem most to demand a place, notwithstanding the very different views that have formerly been held upon the subject. The unisexual flowers, with the parts on a ternary plan, scrambling habit, disunited carpels, and copious albumen, now appear of more importance than the hypogynous insertion of their stamens and the polypetalous flowers.

The few species hitherto discovered belong to the continents and islands of India, Japan, and the hotter provinces of North America.

The species abound in mucus, and appear to be quite insipid. The fruit of some are eaten. Siebold describes that of *Kadsura japonica* as being viscid, tasteless, and uneatable; he adds, that by boiling a sort of mucilage is obtained from its branches and applied to the fabrication of Broussonetia paper; it is also employed by the Japanese women to cleanse their hair of the pomatum they so largely employ.

#### GENERA.

*Kadsura*, *Juss.*

*Sarcocarpum*, *Blum.*

*Sphaerostema*, *Blum.*

*Schizandra*, *L. C. Rich.*

*Hortonia*, *Wight.*

? *Mayna*, *Aubl.*

NUMBERS. GEN. 5. Sp. 12.

POSITION.—Myristicaceæ.—SCHIZANDRACEÆ.—Lardizabalaceæ.

*Anonaceæ.*



## ORDER CIV. MENISPERMACEÆ.—MENISPERMACEÆ.

*Menispermaceæ*, Juss. Gen. Syst. (1789), p. 449. 1. 1789. *Menispermaceæ*, DC. Prodr. 1. (1824), p. 114. *Wright and Arnold*, *Flora of the U. S.*, 1. 1828, p. 114. *Wright*, *U. S. Bot. Trav.*, 1. 1829, p. 114.

**Diagnosis.**—*Menispermaceæ*, *Wright*, with *menispermoid* roots, and a large subglobose or globose quantity of solid albumen.

Stems with a flexible tough tissue, and succulentous lobes; leaves alternate, entire, rarely sinuately lobed, often palmately pinnate and very serrated. Flowers



FIG. CCXII.

small, usually numerous, globose, but not always completely unisexual, rarely 2 or polygamous.  $\sigma$  sepals several, generally in binary, alternate series, gradually smaller externally sometimes in binary rows nearly equal, either with apices or lobes recurved. Petals

usually more slender than the sepals generally 4, in 2 rows and alternate with them, seldom in a binary or single series, and rarely confined to a hyacinthine cup. Petioles generally distinct and equal in length to the petals, just joined opposite to them upon a stipitate subglobose, rarely more numerous, sometimes arranged in a horizontal row, by the union of the filaments into a central column, with the anthers free or united into a solid body. Anthers in the free stamens various in form and devoid of filament; fused or extrorse, 2-celled, in the monadelphous stamens elongated into a globose head in front the point of a gynoecium horizontal dorsal antherium. Ovary usually self rudimentary points often wanting. 2. Stigma and style generally as in the  $\sigma$ , rarely each reduced to a single rudimentary placed before the other at the foot of a single ovary. Stamens often distinctly 2-ranked, with the anthers only reduced to a glandular pale substance only rudimentary or scale-like, often wanting, some generally 4 sometimes 5, the whole of which do not always become branched, the first seated on the summit of a slender moniliform stalk with a single scale attached by its edge to a placenta upon its axis then with the remaining 3 or 4, some becoming curved by the extraordinary growth of the placenta, and



more or less homotropal or campylotropal by the greater increment of the ovary on the dorsal face. Drupes usually fleshy, containing a single nut obsoletely 2-valved, greatly various in form and development, always 1-celled, with the cell more or less curved about a central process (condyle), which is a peculiar development of the placenta. Seed single, partaking of the form of the cell, enveloped in a membranous integument, attached by its ventral face to the condyle, albuminous or exalbuminous; albumen, when present, abundant or small in quantity, either homogeneous in texture or partially divided into lamellar plates or convolutions, in which case the integumental covering partly enters into its numerous interstitial spaces. Embryo homotropous or campylotropous; cotyledons either flat and foliaceous, and either incumbently parallel or laterally widely divaricated, and placed in distinct cells of the albumen, or with cotyledons narrow, flattened, accumbent, and coiled in a perispherical form, or very long, slender, terete, accumbent or incumbent, and coiled in a hippocrepical or somewhat annular form; in the exalbuminous tribe the cotyledons are large, thick, fleshy, and hippocrepically or reniformly bent, and incumbent; the radicle in all cases is superior, short, terete, curved more or less, and pointed to the style or original apex of the fruit, which, by its inflexion, is often curved downwards to near its base.—*Miers*.

Our knowledge of this curious family has hitherto been extremely imperfect, and I am indebted to Mr. Miers for the above outline and for the facts upon which the following observations are founded: he has prepared an extensive monograph of the whole order, with numerous drawings and analyses, which are not yet published, but he has given a slight outline of these results (*Ann. Nat. Hist.*, 2nd. Ser. vii. 33). In the "Introduction to Botany," this family was placed in the class Imperfectæ, on account of its undeveloped flowers and curved embryo; but in my subsequent arrangement in the former edition of this work (p. 307), it was arranged among diclinous exogens, in a distinct alliance, under views in which Mr. Miers does not concur. He thinks that Monimiaceæ, Atherospermaceæ and Myristicaceæ form a good alliance in the same position, but that Menispermaceæ, Schizandraceæ and Lardizabalaceæ constitute another valid group which should occupy a different place in the system; the former being monochlamydeous and essentially unisexual, might retain its place among diclinous exogens, but the latter are truly dichlamydeous, for although the petals are generally reduced to the size of scales, they are ever regular in their form and number, and with rare exceptions, constantly present; the diclinous character of their flowers is due only to abortion, for they are sometimes hermaphrodite or polygamous, and in the ♂ flower rudiments of the ovaria are commonly seen, and in the ♀ the sterile stamens are of frequent occurrence. Mr. Miers, therefore, argues that according to the rule laid down in this work (p. 240), such flowers should not be held to be truly diclinous; and he would say that on account of their many seried floral envelopes and numerous 1-ovulate carpels, this alliance should find its place in the system between Ranales and Berberales. I have already pointed out the affinity of the Kadsurads to the Magnoliads (p. 418). The Menispermads at the same time approach the Anonads (especially the tribes Bocagæ and Xylopieæ) in their bisexual flowers, the frequently valvate æstivation of their flowers, their numerous unilocular carpels with ovules attached to the ventral suture, and in their seeds often with albumen divided into lamellar plates. This is nearly the position long ago assigned to the family by botanists; De Candolle, however, suggested a resemblance to the Sterculiads, on account of their monadelphous stamens and peltate leaves, but they differ in all other most essential respects. According to St. Hilaire they are related to Spurgeiworts, because *Phyllanthus* sometimes has its anthers born on a monadelphous column, as in *Cissampelos*, a rare occurrence in both families, and there is little else to support so distant a conclusion. Mallowworts have also been suggested, with as little foundation.

Mr. Miers remarks, that there is probably no family so completely heteromorphous as the Menispermads, or that presents such extreme and aberrant features, at variance with its normal structure: these extremes are found in the habit of the plants, in the texture and form of the leaves, in the various modes of inflorescence, in the number, arrangement, and manner of æstivation of the floral envelopes, in the form and position of the stamens, as well as in the structure of the anthers and their mode of dehiscence, in the presence or absence of a distinct gynophore, in the variable character of the style and stigma, in the extent of development of the ovules, in the form of the nut, in the seed, sometimes exalbuminous, at others with albumen highly developed, which is often fleshy and homogeneous, copious or "sparse" in quantity, and in other cases singularly constructed of lamellar plates; and finally in the variation of the form and development of the embryo, whose cotyledons are sometimes large, fleshy, and adpressed, or they are slender and terete, or long and ribbon-formed, foliaceous, thin in texture, divaricate, and placed in separate cells in



the attachment. Such extreme difference in structural arrangement is not, however, cases, indeed a division of the family into distinct orders; but new Menispermaceæ possess so many features in common, and at the same time differ from each other, that plants that their internal organs belong to the same group, or tribe, should be named. These are here well treated by Mr. Miers in the following manner:—1. *Spirospermum*: Embryo hemitropal; cotyledons 2, linear, broadly ovate, elongated, and placed in distinct cells formed by the expansion of two rows of mucous cells above, and simple and thin, the ventral thick and deeply convex, and generally divided into numerous transverse plates, separated either by the lobes or edges of the mucous cells; radicle short, terete, incurved, and superior. 2. *Atmospermum*: Sepals valvate, cut in articulation. Embryo laterotendril, or campylotropal; terete, broad, hemitropal; does not thicker than the style, incumbent, curved, and hypogynous; cotyledons 2, radicle short, superior, sometimes directed nearly to the basal style; albumen copious, cleft all round embryo into numerous irregular rounded lobes, or deep fissures. 3. *Tiliacoreum*: Inner row of sepals valvate in articulation; embryo lappet-shaped, campylotropal; cotyledons long, narrow, ribbed forward, incumbent; radicle short, directed towards the style, which is convex, curved to form the loop of the sperm-attachment as in the Atmospermum. 4. *Lernææum*: Sepals imbricate in articulation; stamens distinct or united in a central column; embryo lappet-shaped, campylotropal; cotyledons long, slender, terete, sometimes curved to a nearly circular form; radicle superior, antitropal; albumen simple, small in quantity. 5. *Græceæ* complex: Embryo hippocrepically campylotropal; cotyledons elongated, flat, ribbed, shaped, incumbent, curved in a nearly annular or horseshoe form, united in articulation, small in quantity. 6. *Pachyocarpus*: Inner row of sepals often lobed; sometimes valvate in articulation; embryo orthotropal; cotyledons large, more fleshy, incumbent, curved hemicyclically; radicle small, pointing toward the basal style.

The woody branches of the Menispermaceæ, like most climbing genera, often present a peculiar appearance; on taking a transverse section, the medullary plates, in solid and compact ribs, are seen to radiate from the central pith like the spokes of a wheel, and are connected with each other on the circumference by curved segments of similar material, leaving large well-defined spaces between them, along each with coarse longitudinal fibres, without muriform cellular tissue, and among these large hollow ducts visible to the naked eye, and which, when dried, become detached in separate bundles like so many cords of unequal size, giving the wood great flexibility and toughness. For a long time these stems were supposed to be having a conclusion drawn from specimens of a single year's growth collected in England, but older stems sometimes exhibit as many as half a century's growth, as distinct as those seen in pine-wood. The leaves have a peculiar appearance, often 2-ranked and carinate, sometimes thin and finely reticulated, generally with glandular secretion often more or less potent; and this occasionally to such an extent that some species of *Cissampelos* present an orbicular blade borne nearly on its surface upon the petiole, like the leaf of the common garden Tropæolum. Flowers are generally sessile, and of a pale greenish hue. Mr. Miers thinks that, normally, they are not unisexual, but that this happens only from partial sterility; he generally the confirmation of the account seen in the male flowers, and sterile stamens occur in the female stamens. In *Hippocrepis dealbata* they are usually polygamous, and in *Tiliacora* probably hermaphrodite. The radicle is stated by many botanists to be superior; this, however, is a mistake; it is always superior, and directed towards the perispermic axis, which, whatever be the erect position, at little more than its original distance from the point, appears in the loose fruit as if it were nearly basal, owing to the extraordinary but excessive growth of the ovary on its dorsal side.

Several of the plants of this order are described as being remarkably fructicose in life, so that if a large branch be broken at a considerable distance from the ground, the upper portion immediately throws out a slender sprout, from which readily re-establishes a connexion with the soil and preserves the parent stem growing as usual. I have been seen eight feet long, and yet thinks that sometimes grow plants of 10 ft.

*Spirospermum*, *Azalea*, *Helix*, and *Alnus* are counted here, the family. The latter is identical with *Spiræa*. Lilies belong to the same group of growing habit here by many botanists, but which differ in having more developed pedicels with which the stamens always alternate, and a single ovary, in the female position, and always unilocular, has always the ovary suspended from the summit of the style; the fruit is regular in form, without any tendency towards the protruding structure development, invariably seen in the Menispermaceæ.

This order is common in Asia and America. Climate within the tropics; the species are found in woods, climbing along trees to a great height.



Active narcotic and bitter qualities prevail among the species, the former in excess, rendering them poisonous, the latter causing them to be regarded as valuable tonics: a few are mucilaginous. These properties are due to peculiar principles residing in the plants, and called Calumbine, Menispermine, and Picrotoxine, the characters of which are yet little known. Calumbine occurs in the root of *Jateorhiza palmata*, the Calumba root of commerce, which is extensively used on the coast of Africa as a tonic; it is narcotic and bitter. It is also found in several species of *Tinospora*. *Botryopsis platyphylla* and *cinerea* (called Butua), *Cissampelos ovalifolia* (Orelha de Onça) are used in Brazil, and *Cissampelos Pareira* (Pareira brava), and *Caapéba* in the West Indies, *Cissampelos Mauritian* in Madagascar, *Coscinium fenestratum* (Weni-vel) in Ceylon, and *Tinospora Bakis* in Senegal, as tonics and diuretics. The Brazilians administer *Cissampelos glaberrima* and *ebracteata* against serpent bites. An

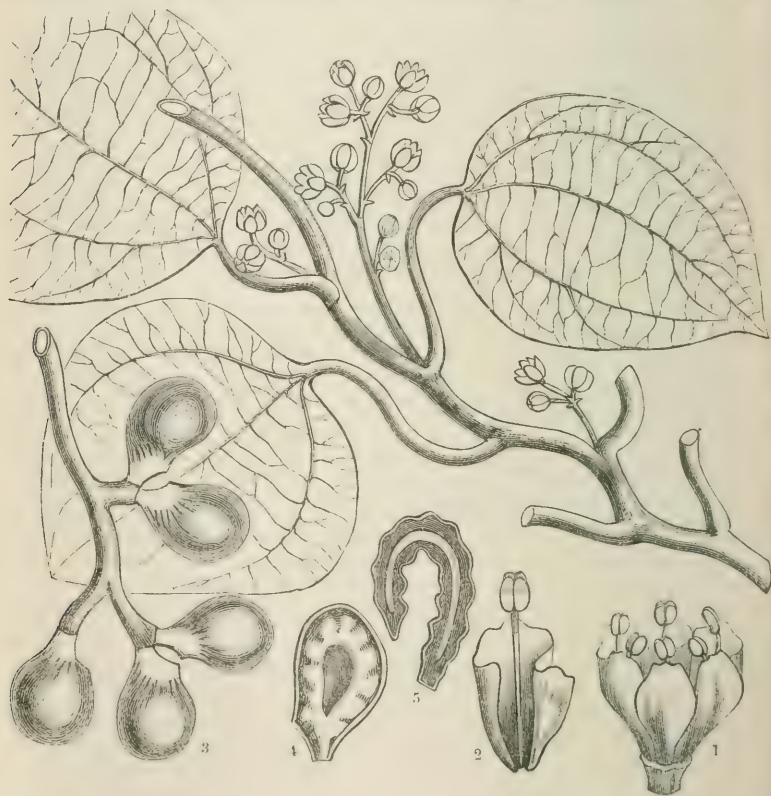


Fig. CCXIII.

intoxicating spirit is obtained from the root of *Cissampelos obtecta* (Royle); that of *Cissampelos glabra* is said to be extremely acrid. (Roxb.) The bark, wood, and leaves are also employed for the same purposes; the stalks and leaves of *Tinospora cordifolia* are much used as a tonic, in an infusion called in Bengal Pachána, while an extract of the stem, called Palo, is regarded as a diuretic. The bark of *Chondrodendron convolvulaceum* (Uva del monte), is employed as a febrifuge in Peru. Endlicher states that the bark of some species is used for dyeing yellow. Wight says that extract of Galuncha, so much recommended in India as a febrifuge, may be prepared from the bruised stems of *Tinospora verrucosa* and *cordifolia*; the young shoots of the latter are a powerful emetic. The wood and bark of *Coscinium* are regarded as furnishing

Fig. CCXIII.—*Cocculus macrocarpus*—after Wight. 1. ♂ flower; 2. a petal and stamen; 3. a cluster of fruit; 4. seed; 5. section of ditto showing embryo.







ALLIANCE XXIV. *CUCURBITALES*.—THE CUCURBITAL ALLIANCE.

DIAGNOSIS.—*Diclinous Exogens, with monodichlamydous flowers, inferior fruit, parietal placentæ and embryo without a trace of albumen.*

The plants of this Alliance differ from all others in their diclinous flowers, combined with an inferior ovary, whose placentæ are more or less manifestly parietal. They approach Menispermads in their scrambling habit, and Passionworts in their placentation. In the greater part the stigmas are horseshoe-shaped. They differ from Papayals in their inferior ovary and exalbuminous seeds, and from the scrambling genera of Euphorbials in the same circumstances.

## NATURAL ORDERS OF CUCURBITALS.

<i>Fruit pulpy. Placentæ strictly parietal. Monopetalous . . . .</i>	105.	CUCURBITACEÆ.
<i>Fruit dry. Placentæ strictly parietal. Apetalous . . . .</i>	106.	DATISCEÆ.
<i>Fruit dry. Placentæ projecting and meeting in the axis. Mono-</i> <i>dichlamydous . . . . .</i>	107.	BEGONIACEÆ.







the former of these two writers a very particular account of the structure of the Order has been given in the *Mémoires du Muséum*. He adopts the opinion of Jussieu, that the apparent corolla of these plants is really a calyx, considering the apparent calyx to be merely certain external appendages. In discussing the affinities of the Order, which he does much at length, he remarks, that *Carica* (now the type of the Order *Papayads*) should

be excluded; that the tendrils of Cucurbits are transformed stipules, but scarcely analogous to the stipules of Passionflowers; that there is an affinity between the Order and Bell-worts, manifested in the perigynous insertion of the stamens, the inferior ovary, the single style with several stigmas, the quinary division of the flower connected with the ternary division of the fruit, and, finally, some analogy in the nature of the floral envelope.

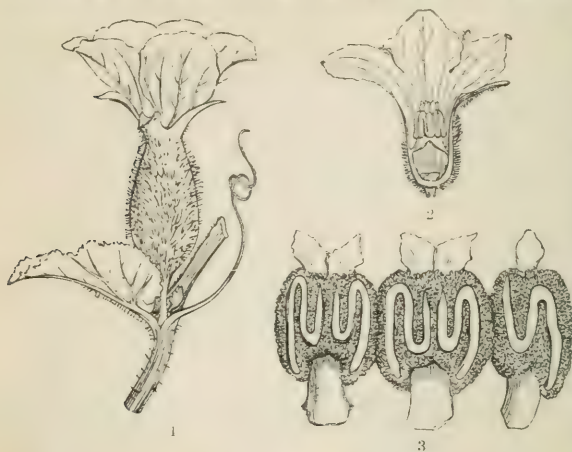


Fig. CCXVII.

lopes. He, however, chiefly insists upon their affinity with *Onagrads*, with which, including *Myrobalans*, they agree in their definite perigynous stamens, single style, exalbuminous seeds, fleshy fruit, and occasionally in the unisexual flowers and climbing stem, being connected in the latter point of view with *Onagrads* through *Gronovia*, a climbing genus then referred to that Order. He also points out the further connection that exists between Cucurbits and *Onagrads* through *Loasads*, which, with an undoubted affinity to the latter, have the habit of the former, especially in the genus *Gronovia* which has just been named. With regard to the supposed affinity of Cucurbits to *Myrtles*, this is founded upon the characters of a small group, called *Nandhirobæ*, consisting of plants having the habit of Cucurbits, but some resemblance in the form of the fruit to that of *Lecythids*, which border closely upon *Myrtles*.

The true affinity of Cucurbits seems, however, to be with diclinous Orders. Into *Lardizabalads* they run through *Zanonia*; the relation to *Spurgeworts* is indicated by the climbing habit and the ternary plan of structure observable in the ovary of both Orders, coupled with their disunited sexes; and then to *Papayads* they belong in everything except their adherent ovary and exalbuminous seeds.

The plants called *Nandhirobæ* by Auguste de St. Hilaire, whom Endlicher follows, do not appear to differ essentially from other Cucurbits. *Zanonia* indeed, with its panicles of small flowers and capsules opening at the point with 3 valves, has a peculiar habit approaching *Tetrameles*, and so connecting this Order with *Datiscads*; but it is associated with the genus *Feuillea*, which seems to be a Gourd and nothing else, notwithstanding its axillary tendrils. The characters relied upon to distinguish *Nandhirobæ* as an Order are, 1. a 3-celled ovary; 2. the position of the ovules; 3. the distinct styles; 4. the oblong anthers and axillary not lateral tendrils. But there does not appear to be any difference between the placentation of *Zanonia* and common Cucurbitaceous plants; its 3 cells are formed by the adhesion of 3 projecting parietal placentæ; 2. if the ovules of *Feuillea* are ascending, those of *Zanonia* are horizontal; 3. the styles of *Luffa* are hardly united, and if it were otherwise, such a character would not be entitled to much attention; 4. the anthers of *Zanonia* and *Feuillea* are not alike, and those of the latter genus do not seem to be essentially different from those of *Telfairia*, *Zehneria*, and *Mukia*. As to the supposed axillary stipules of *Nandhirobæ* I can only say that they are represented to be lateral in *M. Turpin's* figure of *Feuillea hederacea*, drawn expressly to illustrate this supposed Order, and that they are certainly so in *Z. cissoides* and *clavigera*.

According to *M. Payer*, the tendrils of Cucurbits are the two lateral fibrovascular bundles out of the 3 which each leaf forms in its axil.—*Ann. Sc. 3 ser. III. 164.*



The anther lobes of the *Oreolus* are commonly not united, and the *Cucurbit* the ripe fruit opens by valves at the perit.

The placentation of this Order has sometimes perplexed many botanists. They have supposed that it is essentially different from that which prevails in other plants. The nature of De Cussid's and others has been that in *Cucurbita* the ovary pollens leaves are not curved inwardly, but outwardly, their middle being in the same circumference of the fruit. This view has lately been advanced by Dr. Wight on the *Illustration of Indian Botany* and elsewhere; and seems to have been taken from the peculiar appearance of such fruits as the *Cucurbita* when put transversely, in which case the placentae do certainly appear as if they were out of their ordinary position; but if the fruit of those plants is examined early enough it is evident that the illusion arises from a partial placentae, with revolute seed-bearing edges projecting forward into the cavity, where they adhere. In the garden *Cucumber*, for example, when half an inch long, the placentae are exactly as in this cut, CCXVII. fig. 1 and have no adhesion. There is, therefore, no ground for regarding the Cucurbitaceous structure of variate with general rules. There is, however, a great similarity in the fruit of some of them, such as *Luffa foetida*, which, when ripe, appears to consist of horizontal fibres forming a singular entangled mass; these are visible in the young ovary in the form of small transparent concentric lines which have a somewhat perpendicular direction in the placentae; thus apparently proving that part to be a portion of the carpellary leaves and not an independent part of the axis, as Schleiden's theory would suggest.

Natives of hot countries in both hemispheres, chiefly within the tropics; a few are found to the north in Europe and North America, and several are natives of the Cape of Good Hope. India appears to be their favourite station; a good many occur in Peru and Brazil, but are little known; one is found in Norfolk Island, and they are met with in Australia.

Those which are annuals readily submit to the effect of northern frosts during the summer, and hence, although mostly of tropical origin, they are common in European gardens.

I borrow the following account of the properties of these plants, with some alterations and additions, from Dr. Wight's very useful *Illustration of Indian Botany*. Although we best know the *Cucurbit* by their use as edible fruits, the *Melons*, *Cucumber*, *Vegetable Marrow*, and similar plants being the common species, yet many and a drastic tendency pervade many species, the fruits of some of which afford cathartics of remarkable power, acting, in even small doses, with great energy on nearly the whole line of the alimentary canal. Generally speaking, however, the intensity of power is of rare occurrence, though the property is *latent* even in those which in every part of the plant; mildly in the roots of some and the leaves and young shoots of others, but in greatest intensity in the part surrounding the seed. The seeds themselves do not partake of the property, being, in nearly all, mild and oily. There is reason to believe that some at least, if not all the edible sorts, are given treated from spontaneous properties to cultivation, for some in the wild state are found to possess these in great activity. The *Lagenaria vulgaris*, or *Bottle Gourd*, may be cited as an example of this; it being recorded that some sailors were preserved by drinking from one that had been standing in a flask made of one of those Gourds; and the *Bottle Gourd* is sometimes

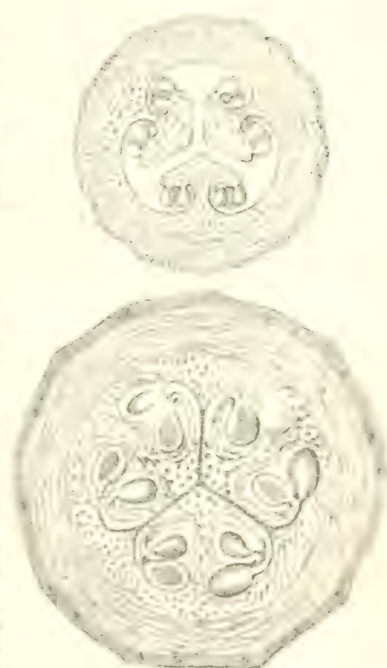


FIG. CCXVIII.

FIG.—CCXVIII. 1. A section of a very young *Cucurbita*, from within the ovary; 2. The same at a period subsequent to the setting of the fruit.



similar case, where symptoms of cholera were induced by eating the bitter pulp. The fruit of many of the species of *Cucumis*, the genus to which the Melon and Cucumber belong, are powerfully cathartic; among these *C. Hardwickii* and *C. pseudo-colocynthis* may be enumerated as the chief; but even the Cucumbers, especially the less highly cultivated varieties of India, are sometimes known to prove strongly aperient in susceptible constitutions. *C. Colocynthis* (now *Citrullus*), the source of the drug Colocynthis, affords one of the most valuable medicinal agents derived from the Order. The Melon, *C. Melo*, and *C. utilis*, so far as I have been able to learn, is free from it. The fruit of some species of *Luffa* is violently cathartic, such as *L. amara* and *L. Bindaal* of Roxburgh, and the Brazilian *Luffa* purgans and drastica mentioned by Martius; yet, those of *L. acutangula* (*Cucumis acutangulus*, *Ainslie*) are a favourite potherb of the natives of India, and are esteemed very wholesome. Some of the species of *Bryonia*, especially *B. alba* and *B. dioica*, partake of the cathartic properties of the family in great intensity. Curiously enough, the juice of their root is strongly cathartic, and is often employed as such, while the young shoots are so free from the property, that they are used as potherbs, and are reported to resemble *Asparagus* in flavour. The purgative properties of *Bryonia* root have been long known, and in the opinion of some modern writers have fallen into unmerited neglect, they being fully equal in power, even when dried and powdered, to Jalap, and when recent much more so. *Bryonia americana* and *africana* are said to have similar properties. Yet the root of *B. abyssinica*, when cooked, is said to be eaten without danger. The root of *Bryonia epigaea* was once supposed to be the famous Calumba; (see *MENISPERMACEÆ*). Nearly allied to these plants appear to be various species of little known genera, *Trianosperma*, *Wilbrandia*, and *Cayaponia*, Brazilian drastics of great energy. *Trianosperma ficifolia*, indeed (*Bryonia ficifolia*, *Lam.*) is a species of great reputation for its activity as a purgative and purifier of the blood. But of all those yet mentioned, none approach the spirting Cucumber, *Ecbalium agreste* (*Momordica Elaterium*, *L.*, *σίκυς ἄγριος*), in the concentrated virulence of this quality. It is a native of the hotter parts of Europe, and remarkable for the force with which its poisonous pulp is suddenly expelled from the interior of the fruit, when it is quite ripe and the stalk is loosened. An ingenious explanation of this curious phenomenon has been given by Dutrochet in his *Nouvelles Recherches sur l'Endosmose*. A few grains of *Elaterium*, a drug prepared from the pulp of this plant, have been known occasionally to bring on symptoms of poisoning; a case is recorded by Dr. Christison, where a person, after carrying a specimen in his hat, was attacked with headache, succeeded by colic pains and frequent bilious vomiting and purging. Such being the predominant quality of the family, it is well to be cautious in the use of even the best known species.

Many, however, are in use as potherbs, among which may be mentioned with just encomiums the red Gourd, *Cucurbita maxima*, the flesh of which, when boiled, somewhat resembles in taste a tender Carrot; the Water Melon, *Cucurbita citrullus*, so highly esteemed for the cool refreshing juice of its large fruit; the white Gourd (*Benincasa cerifera*, or *Cucurbita pepo*), which *Ainslie* informs us is presented at every native marriage feast, being supposed to insure prosperity to the wedded pair; the Vegetable Marrow (*Cucurbita ovifera*), justly esteemed one of our finest culinary vegetables, and a few others. All the numerous cultivated varieties of the Melon and Cucumber are known to be wholesome. Some, if not all the Indian species of *Momordica*, seem equally safe. *M. Balsamina*, a species with a singular warted fruit, and *M. Charantia*, when steeped in oil, have some reputation as vulneraries. In a green state they form an agreeable pickle. It should be observed, however, that the fruit of a plant called *Neurosperma cuspidata* by Rafinesque, which is generally supposed to be *Momordica Balsamina*, is, according to that author, a dangerous poison, or in small doses a hydragogue. *Momordica operculata*, a plant common in the southern provinces of Brazil, quite answers to the character given of this *Neurosperma*, so far as its drastic qualities go.

A waxy substance is secreted by the surface of the fruit of *Benincasa cerifera*. The fruit of several species of *Trichosanthes*, especially that of *T. anguina*, are in daily use in India, even among Europeans, dressed in curries; but those of *T. palmata* are not employed, and are considered poisonous by the natives. Those of *Coccinia indica* (*Momordica monadelphica*, *Rorb.*), so common in every Indian hedge, are eaten by the natives in their curries, and when fully ripe (quite red and pulpy) seem to afford a favourite repast to many birds.

The seeds of all the species are oily, and capable of forming very readily an emulsion; those of *Telfairia pedata* (*Joliffia africana*, *D.C.*), an African plant, are as large as Chestnuts, and said to be as excellent as Almonds, having a very agreeable flavour; when pressed they yield an abundance of oil, equal to that of the finest Olives. The pulp is excessively bitter, and produced a violent headache when only applied to the tongue. De Candolle remarks, that the seeds of this family never participate in the



property of the pulp that surrounds them. The blackish, slender, but not very long, of *Freilasia repens*, a West Indian species, are, however, bitter and are a valuable feeding-stuff for cattle and pigs. The seeds of *Freilasia repens* yield a fatty oil used as a food for man, in parts of the forests. The Americans employ this oil of fatty seeds as a lamp. The balsamiferous tree called, by the Indians, from the form of its seed vesicles, *Zamia indica*, has the taste and smell of Cassia. The leaves have the balsam in both, and mixed with butter, serve for the preparation of an antispasmodic ointment. The seed of some Cerebithaceous plants, called *timourou* seeds, are used in giving a laxative. — *Frut.*

The seeds of *Anisosperma Passiflora* (Fava do S. Paulo, Cacao do S. Paulo) contain a bitter oil, mixed with a bland starchy matter and resin and are common in Brazil as valuable stimulants; in large doses they purge. They, of Hyacinth, Gumpova, another Brazilian kindred, have similar qualities.

## GENERAL

[illegible]

NUMBERS GIVEN: 50. Sp. 270. But this number is too low, in comparison of the South American species having been little investigated.

*Pseudomonas*

Position	Dates from	Organization	Representative
President	1990-1992	University of Illinois	James A. Hirsch
Vice President	1992-1994	University of Illinois	James A. Hirsch
President	1994-1996	University of Illinois	James A. Hirsch
Vice President	1996-1998	University of Illinois	James A. Hirsch
President	1998-2000	University of Illinois	James A. Hirsch
Vice President	2000-2002	University of Illinois	James A. Hirsch
President	2002-2004	University of Illinois	James A. Hirsch
Vice President	2004-2006	University of Illinois	James A. Hirsch
President	2006-2008	University of Illinois	James A. Hirsch
Vice President	2008-2010	University of Illinois	James A. Hirsch
President	2010-2012	University of Illinois	James A. Hirsch
Vice President	2012-2014	University of Illinois	James A. Hirsch
President	2014-2016	University of Illinois	James A. Hirsch
Vice President	2016-2018	University of Illinois	James A. Hirsch
President	2018-2020	University of Illinois	James A. Hirsch
Vice President	2020-2022	University of Illinois	James A. Hirsch
President	2022-2024	University of Illinois	James A. Hirsch
Vice President	2024-2026	University of Illinois	James A. Hirsch
President	2026-2028	University of Illinois	James A. Hirsch
Vice President	2028-2030	University of Illinois	James A. Hirsch
President	2030-2032	University of Illinois	James A. Hirsch
Vice President	2032-2034	University of Illinois	James A. Hirsch
President	2034-2036	University of Illinois	James A. Hirsch
Vice President	2036-2038	University of Illinois	James A. Hirsch
President	2038-2040	University of Illinois	James A. Hirsch
Vice President	2040-2042	University of Illinois	James A. Hirsch
President	2042-2044	University of Illinois	James A. Hirsch
Vice President	2044-2046	University of Illinois	James A. Hirsch
President	2046-2048	University of Illinois	James A. Hirsch
Vice President	2048-2050	University of Illinois	James A. Hirsch
President	2050-2052	University of Illinois	James A. Hirsch
Vice President	2052-2054	University of Illinois	James A. Hirsch
President	2054-2056	University of Illinois	James A. Hirsch
Vice President	2056-2058	University of Illinois	James A. Hirsch
President	2058-2060	University of Illinois	James A. Hirsch
Vice President	2060-2062	University of Illinois	James A. Hirsch
President	2062-2064	University of Illinois	James A. Hirsch
Vice President	2064-2066	University of Illinois	James A. Hirsch
President	2066-2068	University of Illinois	James A. Hirsch
Vice President	2068-2070	University of Illinois	James A. Hirsch
President	2070-2072	University of Illinois	James A. Hirsch
Vice President	2072-2074	University of Illinois	James A. Hirsch
President	2074-2076	University of Illinois	James A. Hirsch
Vice President	2076-2078	University of Illinois	James A. Hirsch
President	2078-2080	University of Illinois	James A. Hirsch
Vice President	2080-2082	University of Illinois	James A. Hirsch
President	2082-2084	University of Illinois	James A. Hirsch
Vice President	2084-2086	University of Illinois	James A. Hirsch
President	2086-2088	University of Illinois	James A. Hirsch
Vice President	2088-2090	University of Illinois	James A. Hirsch
President	2090-2092	University of Illinois	James A. Hirsch
Vice President	2092-2094	University of Illinois	James A. Hirsch
President	2094-2096	University of Illinois	James A. Hirsch
Vice President	2096-2098	University of Illinois	James A. Hirsch
President	2098-2100	University of Illinois	James A. Hirsch

*Sax. Stock, in Trans. Acad. XVIII, 110. Transcription & description of specimen of *Chet. & Cicurb.* 1851. *Chet. & Cicurb.* in *Ann. de nat. Hist. IX, 207.**

Gasparini regards the tendrils as modified leaves, in which he agrees with Sargent. Tassé suggests there to be transformed pubescent, consequently these points to the perfectly hermaphrodite, as occurred in a specimen collected by me June 1, 1848, in which also the ovary was half enlarged.)

Among the notable species should be mentioned the *Chusquea* or *Officinalis* *Guianensis* which, the green fruit of which is esteemed as an emollient in hot countries.

## ADDITIONAL COMMENTS



## ORDER CVI. DATISCACEÆ.—DATISCACEÆ.

Datisceæ. *R. Brown in Donham*, 25. (1826); *Bartl. Ord. Nat.* 419. (1830); *Endl. Gen.* clxxxiv.: *Meisner*, p. 346.

DIAGNOSIS.—*Cucurbital Exogens with apetalous flowers, strictly parietal placentæ, and dry fruit.*

Herbaceous branched plants; or trees of considerable size. Leaves alternate, cut, simple, or compound, without stipules. Flowers in axillary racemes or terminal panicles, ♂ ♀. Calyx of the ♂ divided into 3-4 pieces; of the ♀ adherent 3-4-toothed. ♂ Stamens 3-7; anthers 2-celled, membranous, linear, bursting longitudinally. ♀ Ovary 1-celled, with 3-4 polyspermous parietal placentæ; ovules anatropal; stigmas equal in number to the placentæ, and opposite the lobes of the calyx. Fruit capsular, opening at the vertex, 1-celled, with polyspermous parietal placentæ. Seeds enveloped in a membranous finely reticulated integument, with a cupulate membranaceous strophiole; embryo straight, without albumen, its radicle very long, turned towards the hilum. Cotyledons very short.

The many-seeded capsule of this genus, with parietal placentæ, and open at the apex, naturally suggested its relationship to *Reseda*, with which, however, it really has no other point in common. The foliage and manner of growth of *Datisca cannabina* has in like manner led to the equally wrong conclusion that it might have some connection with Hempworts. An anonymous writer in the *Linnæa* (xiv. 262) has suggested its station to be between Cucurbits and Loasads. This seems to have been a close approach to the truth. It is, however, with *Begonia* that it corresponds most nearly, and it will have to follow the fate of that Order, whether allowed to retain the station now assigned to it or removed to some other place. The unisexual flowers, numerous minute seeds, orthotropical embryo without albumen, and adherent calyx of these two Orders, afford very strong marks of relationship; to which may be added the triple placentation of two out of three of the known Datisceous genera. It is true, indeed, that *Datisca* and *Tricerastes* are said to have albumen; but I can find none in *Datisca nepalensis* when fully ripe, and therefore it may be doubted whether it exists at that time in *Tricerastes*, or *Datisca cannabina*. To this it may be added that the naked mode of flowering in loose terminal panicles, and the oblique leaves of *Tetrameles*, are equally characteristic of *Begonia*.

Fresenius asserts (*Linnæa*, 1839) that female plants of *Datisca cannabina* are capable of bearing seed, although entirely cut off from the males. He regards this property to depend upon a mere act of vegetable increment, which, upon the supposition that an embryo is a bud, is not inconceivable. *Tetrameles*, the Weenong of Java, and Jungle Bendy of Bombay, is remarkable as being a large tree in this very small Order, consisting otherwise of annual stemmed herbaceous plants.

The very few species of which the Order consists are scattered over North America, Siberia, Northern India, the Indian Archipelago, and the south-eastern corner of Europe.

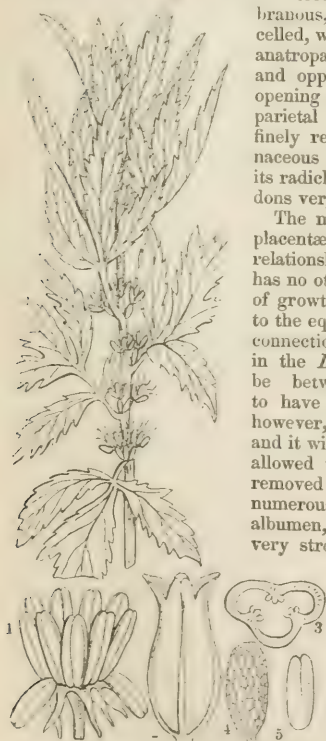


Fig. CCXIX.

Fig. CCXIX.—*Tricerastes glomerata*.—Presl. 1. ♂ of *Datisca cannabina*; 2. its fruit; 3. a cross section of it; 4. a seed; 5. its embryo.



*Datura innoxia* subsp. *purpurea* is commonly used in folk medicine as an analgesic and sometimes emmenagogue. Chinese folk use the leaves to treat rheumatism and to induce abortion. They call it *Datura*.

## CONCLUSION

Department of  
 Communications, 300  
 University Avenue  
 University of Toronto

<sup>a</sup> Numbers 1-618; 2 = 91, excluding Daisies birds, which Mr. Jensen has identified as his Ruffs Typhimys.

Position	Contribution	Difference	Position
		$(\text{cm}^{-1})$	
1	100	0	10
2	100	0	20
3	100	0	30
4	100	0	40
5	100	0	50
6	100	0	60
7	100	0	70
8	100	0	80
9	100	0	90
10	100	0	100



## ORDER CVII. BEGONIACEÆ.—BEGONIADS.

Begoniaceæ, *R. Brown in Congo*, 464. (1818); *Endl. Gen. ccliii.*; *Meisner*, p. 336.

DIAGNOSIS.—*Cucurbital Exogens with dry fruit and placenta projecting and meeting in the axis.*

Herbaceous plants or succulent under-shrubs, with an acid juice. Leaves alternate, toothed, rarely entire, oblique at the base. Stipules large, scarious. Flowers pink, in

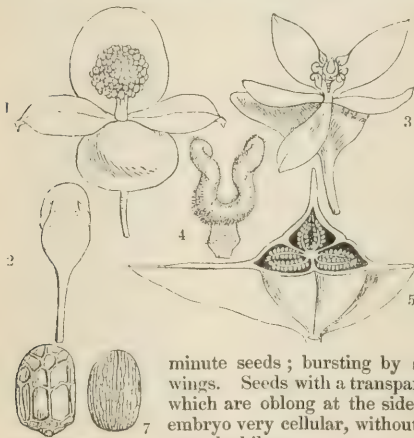


Fig. CCXX.

cymes. Flowers ♂ ♀. Calyx adherent. Sepals coloured; in the ♂ 4, 2 within the others and smaller; in the ♀ 5, imbricated, two smaller than the rest, or 8, of which 4 are petaloid. ♂ Stamens indefinite, distinct, or combined into a solid column; anthers collected in a head, 2-celled, continuous with the filaments, clavate, the connective very thick, the cells minute, bursting longitudinally. ♀ Ovary adherent, winged, 3-celled, with 3 large placenta meeting in the axis; ovules anatropal; stigmas 3, 2-lobed, sessile, somewhat spiral. Fruit membranous, capsular, winged, 3-celled, with an indefinite number of minute seeds; bursting by slits at the base on each side of the wings. Seeds with a transparent thin testa marked by reticulations, which are oblong at the sides and contracted at either extremity; embryo very cellular, without albumen, with a blunt round radicle next the hilum.

It is not a little curious that the opinions of Botanists concerning the affinity of these well-known plants should remain so undecided up to the present day. I formerly supposed the Order related to Hydrangea from some resemblances in its seeds, &c.; others have approximated it to Buckwheats on account of the stipules, 3-cornered fruit, and coloured calyx. Link places it near Umbellifers; Von Martius next Scævolaceæ; Meisner with Spurge-worts; and the tendency to the production of 4 in the sepals and petals, as evinced by Eupetalum, has led to the opinion that it may be related to the epigynous Myrtal Alliance, its seeds being indefinite and destitute of albumen. And that some near relation does exist between such plants and Begonia, is rendered more probable by Bertolonia maculata, which has the winged fruit and much the habit of that genus. Nevertheless, these are but distant points of approach; and the real affinities seem to be with Cucurbits, with which Begoniads accord in the unisexual flowers, peculiar stigmas, and even ternary number of the carpels. The discovery by Mr. Hartweg of Begoniads scrambling up trees and shrubs to the height of 25 feet, renders the resemblance almost complete. To Datisca the relationship seems to be well made out.

The main objection to the association of Begoniads and Cucurbits in the same Alliance arises from the great apparent difference in their placentation; that of Begoniads being axile, and of Cucurbits parietal. But a careful examination of the ovary of Diploclinium Evansianum, acuminatum, incarnatum, &c., shows that distinction to be one of words rather than of essential structure. The ovary of such Begoniads consists of 3 carpels, whose dorsal suture is winged, and whose margins turn inwards for a considerable distance, each margin forming a plate or placenta, over which the ovules are arranged. This, with the exception of the wing proceeding from the dorsal suture, is the structure of Cucumis, as figured at p. 313, fig. 1, with this difference, however, that the inflexed edges of the carpellary leaves adhere in Diploclinium at a very much more early period than in Cucumis. In Diploclinium acuminatum, when the flower-buds hardly project beyond their fringed bracts, these inflexed edges are easily separable from each other and from

Fig. CCXX.—*Diploclinium Evansianum*. 1. a ♂ flower; 2. an anther; 3. a ♀ flower; 4. a stigma; 5. a cross section of the ovary; 6. a seed; 7. an embryo



the soft parts which rise up between them and hold them together. I cannot help ever add that I have ever succeeded in finding the placenta absolutely copious, as in the case in a young Cucurbit. If the two *Begonia*, which (like *B. Meyana*, certainly, you have a netted, not lobbed placenta, are found for an instant in various parts of *Begonia*, evident that the real structure is the same, and that there also the placenta is exactly the same as in *Cucurbit*, except that the inflated edges will be somewhat wider, and that the matter of the funis which runs between them and holds them together is more copious. The ovary of *Begonia Meyana* may even be taken as an excellent illustration of the true nature of that of a Cucurbit.

Common in the West Indies, South America, and the East Indies. Brown observes that no species has been found on the continent of Africa, though several have been in Madagascar and the Isles of France and Bourbon, and one in the island of Zanzibar.

The roots are astringent and slightly bitter. Those of two species are employed in Peru with success in cases of a flux of blood, or in other vascular diseases in which astringents are employed. They are also said to be useful in cases of scurvy, and in certain forms of *B. malabarica* and *tomentosa*, and several others are used as purgatives. The root of *B. grandiflora* and *tomentosa* is bitter and very astringent. Some are said to be *dramo-purgatives* in Mexico (*Enall.*); and if so, this is an additional point of resemblance between them and Cucurbits.

#### GENERA

*Begonia*, L.

*Lepidocarpus*, Lam.

*Dipentodon*, Lam.

NUMBERS. GEN. 2. SP. 140. (*Walpers*).

*Melastomaceae*?

POSITION. — Cucurbitaceae. — BIGNONIACEAE. — DIPSACACEAE.

*Passifloraceae*.

\* *Dipentodon* (not taken from *Begonia*), which has been described by Brown.

#### ADDITIONAL GENUS

*Memoria*, Benth.

The genus *Memoria*, having parietal placentae, confirms the relationship of *Begonia* and Cucurbits. The order should also be compared with *Adiantum*, *Phayella*. It is very much to be regretted that its examination should not be undertaken by some skilful and judicious botanist. It is difficult to believe that such plants as *Begonia alternata* and *collumata* ought to be associated to the same genus with *B. hydrostylifolia* and the diocious species.



ALLIANCE XXV. *PAPAYALES*.—THE PAPAYAL ALLIANCE.

DIAGNOSIS.—*Diclinous Exogens with dichlamydeous flowers, superior consolidated carpels, parietal placenta, and embryo surrounded by abundant albumen.*

If the plants referred to this Alliance had no albumen and an inferior ovary, they would be Cucurbitals ; if their flowers were bisexual and coronetted they would do for Passionworts ; if their fruit were simple and their ovules orthotropal, or at least with the foramen uppermost, they would fall into the Order of Nettleworts. They seem evidently to join the Violal Alliance, the whole of which, if the flowers were diclinous, might have been brought into the closest contact with Papayals, as will be sufficiently evident if Pangiards are compared with Bixads.

## NATURAL ORDERS OF PAPAYALS.

- |   |                 |
|---|-----------------|
| <i>Corolla monopetalous ; ♀ without scales . . . . .</i>            | 108. PAPAYACEÆ. |
| <i>Corolla polypetalous ; ♀ with scales in the throat . . . . .</i> | 109. PANGIACEÆ. |



ORDRE CVIII. PAPAYACEÆ. (PAPAYAS.)

Espèce. *Arbutus Chama* (Willd.)—Cultivée. Taperon in *Att. de Indes* par Jussieu. — *Arbutus Chama* (Willd.)—Cultivée. Taperon in *Att. de Indes* par Jussieu. — *Arbutus Chama* (Willd.)—Cultivée. Taperon in *Att. de Indes* par Jussieu.

FRUITAGE.—*Papaya* Linnæus, with *papayaceæ* flowers, showing the structure of the fruitage.

Trees or shrubs, sometimes yielding succored milky juice. Leaves alternate, latent on long taper petioles. Flowers in axillary racemes or solitary, unisexual. Ovary inferior, minute, 3-lobed. Corolla monopetalous with 3 lobes. 2 Stamens definite, epipetalous; anthers erect, splitting longitudinally, occasionally partly superior. A long free filament with 2 to 3 parietal polyspermate placentæ, stigma 2-3 lobed, exserted. Fruit indehiscent, or dehiscent, 3-lobed, with parietal placentæ. Seed enveloped in a hard mucous coat, with a minute pitted root; embryo in the axis of fleshy albumen with flat cotyledons and a taper radicle turned towards the hilum.

It was the opinion of Jussieu that the genus upon which this Order was originally founded had a sort of middle station between Nettleworts and Cucurbits. Augusto de St. Hilari has, however, remarked upon this subject, that the only relation to him with Urtical plants consists in the separation of sexes, milky juice, latex, which is like that of some species of *Urtica*, &c. &c. which is not very different from that of *Cecropia*, and the position of the stigmas; and to these he attached little importance. But the Papaw tree, instead of standing in the system almost alone, as it has hitherto done, appears to be in reality the commonest of all the unisexual genera hitherto referred to the Cucurbitaceæ. Be it its structure be scrutinized carefully it will be found to differ from that Order in nothing except having a fruit with 3 lobes or 3 parietal placentæ, in its separate sexes, and the absence of the corolla, which in some form or other is so characteristic of the Violæ Alliance. On the other hand, it may be regarded as a Cucurbitaceous plant with a free ovary, a glaucous and often mucous seeds; and on that point of view it equally relates to the unisexual Passerworts. The opinion of Jussieu therefore seems to have been right, as it has so often given rise to in difficult cases.

The species of *Carya* natives of South America, and unknown except as typical nutting, beyond that continent; the other species belong to the temperate parts and tropics of the Old World.

The fruit of the Papaw (*Carica Papaya*) is eaten when cooked, and is considered by some persons to be a powerful purgative, and that the juice of the same fruit is a most powerful and efficient vermifuge (the powder of the seed serving the same purpose), and that a constituent of this juice is *Carica*, a species formerly supposed peculiar to the animal kingdom and to Parasits. The tree has moreover the singular property of rendering the toughest animal substances tender, by causing a separation of the muscular fibre: its very vapour even does this, as may be observed by holding the leaves, and even old hogs and old poultry, when fed on the leaves and fruit, become tender in a few hours. See an excellent account of the Papaw by Hæber in the *Ann. Mag.* 2203. Dr. Wight observes that the seeds, when chewed, yield in a very marked degree, the pungency and flavour of *Trigonotis* species. The mucous-sapidity which renders the Papaw an active vermifuge, is influenced by the fragrant and overpowering odour of its roots, which smell like decaying flutidus. The berries are best by weight

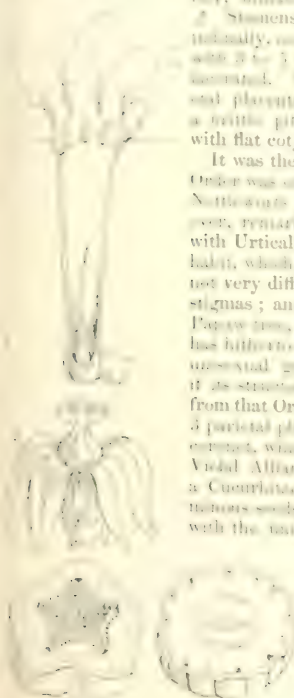


Fig. CCXVI. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



to wash linen, instead of soap. The *Carica digitata*, (Chamburu), a Brazilian plant, is regarded by the natives of Mayna as a deadly poison, and with as much awe as the Upas tree by the Javanese. Pöppig says that the juice which spirted over his skin when he cut the trec, caused itching on the face, and drew a few blisters on his hands ; the male flowers of this plant have the disgusting smell of human excrement. It is worthy of remark that the fruits of the plant, although handsome, scentless, and insipid, are untouched by birds or other animals except an ant belonging to the genus *Atta*. The root of *Modecca palmata*, a native of tropical Asia, rubbed down with oil, is regarded as a corroborant ; mixed with Cocoa-nut milk it is used for pain in the chest. The leaves of *M. integrifolia*, boiled with butter, are used for piles ; its juice is thought to assist labour.—*Endl.*

Vauquelin, who analysed the juice of the Papaw, says that no doubt can be entertained of its being a highly animalised substance ; although it is not exactly like any animal matter known to him. It most resembles animal albumen, dissolving, like it, in water. Its solution is coagulated by heat, by acids, alkalies, the metallic salts, and infusion of nut-galls ; and by distillation it yields the same products as animal substances.

#### GENERA.

Fruit succulent, indehiscent.	Vasconcella, <i>St Hil.</i>	<i>Microblepharis</i> , Wight et Arn.	<i>Kolbia</i> , <i>Palis.</i>
	Tetrapathea, <i>Raoul.</i>	<i>Blepharanthus</i> , Smith.	<i>Ceratiosicyos</i> , <i>Nees.</i>
<i>Carica</i> , <i>Linn.</i>	** Fruit capsular.	<i>Paschanthus</i> , <i>Burch.</i>	<i>Acharia</i> , <i>Thunb.</i>
<i>Papaya</i> , <i>Tournef.</i>	<i>Modecca</i> , <i>Linn.</i>		<i>Botryosicyos</i> , <i>Houtst.</i>

NUMBERS. GEN. 3. Sp. 25.

POSITION.—*Cucurbitaceæ.*  
—PAPAYACEÆ.—*Pangiaceæ.*  
*Passifloraceæ.*



Fig. CCXXII

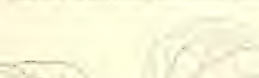
Fig. CCXXII.—Fruit of *Carica Papaya*.



## O. J. C. N. PANGLOSS = PANGLOSS.

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DIAGNOSIS.—Ptyopod fungus, with *perithecia* fulvous, becoming white later, producing the bluish green of the *perithecia*.


 Truss. Leaves alternate, stalked, ovate, acuminate, serrate. Flowers axillary, solitary or fascicled, at the base of the leaves. Sepals 5, rarely 6, 2, 3, 4. Petals 5, rarely 6. Stamens numerous, opposite the petals. 5 Stamens, 5, 6, 6; not a filament of 2. 2. Stamen stamens equal in number to the petals. Filament longer. Ovary free, 1-locular, ovules 60, attached to it. 3 perianth segments. Capsules persistent, indehiscent, 1-celled. Seed 60, large, albumen abundant, oily; embryo mostly as large as the albumen; cotyled. protracted, cylindrical, generally hoary and viscid. — *Boiss.*

What the distinction is between these plants and *Papaver*, except that the first are *triflorae*, and have no two-lobed petals in the flower, I do not say. Mr. Bennett knows right from the matter, and I am unable to say any.

The opium grown in the lower parts of India. All are *popavaria* plants. The seeds of *Corymbaria* *barbata* are employed extensively in the culture of India in the case of *popavaria* ill-effects. When freed from the integuments there are beaten up with earthy matter and a soft mass, and on this mass spread twice a day the paste affixed. Chaulmoogra and Petroleum are the better names. Hyalinated yellowish a Chinese plant related to the *popavaria* bears a poisonous fruit, which when eaten causes *Chaulmoogra* and *popavaria* intoxication. It is used in China to



poisoning fish, which afterwards causes the accumulation of poison until fish die. According to Rumphius, the plant *Pongia* has a fruit, called *banda*, and the leaves are boiled, then cut to pieces and macerated in cold water to remove the poisonous substance.

FIG. 1. CONNELL.—Pipitids of the *Hypodius* group.  $\frac{1}{2}$  life.  $\frac{1}{2}$  = average length of middle toe and claw;  $\frac{1}{2}$  = average length of bill;  $\frac{1}{2}$  = average length of hind toe and claw;  $\frac{1}{2}$  = average length of tail;  $\frac{1}{2}$  = average length of wing.



after which they are dried to be used as a condiment. The bark thrown into water poisons fish ; the juice of the leaves is used for destroying vermin, and in cutaneous diseases, and cows die from feeding on them. The oil of the seeds is however employed for frying. Dr. Horsfield adds that these seeds are rarely used, and curry containing them operates as a cathartic on persons unaccustomed to them.

GENERA.

Pangium, <i>Reinw.</i>		Chaulmoogra, <i>Roxb.</i>		Hydnocarpus, <i>Gærtn.</i>
Gynocardia, <i>R. Br.</i>		Chilmoria, <i>Hamilt.</i>		Munnicksia, <i>Dennst.</i>
Bergsmia, <i>Bl.</i>				

NUMBERS. GEN. 3. Sp. 4.

POSITION. ——— PANGIACEÆ.—Papayaceæ.  
Bixaceæ..



## SUB-CLASS II. HYPOGYNOUS EXOGENS.

The hypogynous insertion of the stamens has been regarded by the French School of Botanists as one of very great systematical importance; and it does seem to collect together a large mass of plants the genera of which have a great resemblance to each other. If we assume that the entire separation of the ovary and ovules from the stamens is an indication of those organs being in hypogynous plants of less importance than usual, then the character acquires a physiological value not previously assigned to it. And such appears to be the case; for it is only among hypogynous *Scrophulaceæ* that we find a total absence of floral envelopes, as in the *Piperidæ* and *Chenopodiæ* Alliances; it is among them that the presence of petals seems to be at least uncertain, as in the character of a Natural Order; for in 10 Alliances out of 14, petals are either constantly or frequently absent, and in one only are they often contained into a tube; in all other cases such a circumstance is exceptional.

It is, however, found that in some cases plants with a perigynous insertion of the stamens will nevertheless combine with hypogynous Alliances; as happens in the case of *Saurys* among *Violacæ*, and here and there in the *Ericæ*, *Sileneæ*, and *Chenopodiæ* Alliances; but these again seem to be mere exceptional instances not affecting the general value of the hypogynous character, even where it is certain that the *Oxalis* in which such exceptions occur are rightly placed. Experience shows too that all natural groups of plants come in contact here and there; and in such instances exceptions to habitual structure make their appearance. It will be found, moreover, that the perigynous Orders or genera here and there introduced among the hypogynous series refuse to associate with any part of the perigynous Sub-class. Thus *Saurys*, a perigynous form of *Violacæ*, have no *long stamens* in any perigynous Alliance, while their affinity to the hypogynous *Violacæ* is of an obvious nature.

The sequence observed in the arrangement of the Alliances is chiefly remarkable on account of the presence of *Barbards* in contact with *Ericæ*; but if we regard *Crocollacæ* and *Pittosporacæ* as *Barbards*, then the *Ericæ* and *Humiriacæ* join them perfectly; but these approximations have not yet received the sanction of Botanists, and depend for their justification upon giving a higher value than customary to the presence of a small pedicel in copious albumen.

There can be no doubt about the closeness of the relationship borne by the *Scrophulacæ* Papayals to the hypogynous *Violacæ*, and therefore it is with the latter that the hypogynous series is made to begin. The transition from *Violacæ* to *Cissacæ*, *Ranunculacæ*, *Malvaceæ*, to *Sapindacæ*, and to *Guttiferacæ* is so much in conformity to the views generally entertained by Botanists, that no objection to it is anticipated. The next step to *Hydrophylacæ* is more open to criticism; but if *Tursacæ* are taken as an extreme form of *Hydrophylacæ*, there is no difficulty in admitting the justice of bringing *Nymphaeacæ* into contact with them. The next relationship, that of *Ranacæ*, is obvious; their *Papaveraceæ* (except the genus, *Hyoscyamum*, which stands on the limits of *Papaveraceæ* among *Barbards*), and either *Cyrtillacæ* or *Olaeacæ* will join the chain to *Humiriacæ* among *Ranacæ*. On the latter Alliance *Heathworts* themselves come distinctly in contact with such monogynous *Raneworts* as *Correa*. *Geraniacæ* join *Ranacæ* by means of *Oxalacæ* and *Sileneæ* through *Flaxworts*; and, finally, the *Chenopodiæ* and *Piperidæ* Alliances, the apparently degraded forms of the *Sileneæ* Alliance. *Pipunculacæ*, however, to be regarded as a lateral offshoot from *Chenopodiæ* rather than as an *Oxalis* in the strict sense, according to the perigynous Sub-class.



## ALLIANCE XXVI. VIOLALES.—THE VIOLAL ALLIANCE.

DIAGNOSIS.—*Hypogynous Exogens, with monodichlamydeous flowers, parietal or sutural placenta, and straight embryo with little or no albumen.*

If we except Moringads, Tamarisks and Houseleeks, which are doubtful members of this Alliance, the present group seems quite natural; and those Orders themselves appear to find no better station, as will be shown when speaking of their respective affinities. The parietal placentation is without example among Hypogynous Alliances, except in Cistals, whose curved or spiral embryo seems to distinguish them perfectly.

## NATURAL ORDERS OF VIOALS.

- |  |   |                      |
|--|---|----------------------|
| <i>Flowers scattered, apetalous or polypetalous. Petals and stamens both hypogynous. Leaves dotless, or with round dots only. . .</i>  | } | 110. FLACOURTIACEÆ.  |
| <i>Flowers in catkins, apetalous, scaly, polygamous. Stamens unilateral . . . . .</i>  |   | 111. LACISTEMACEÆ.   |
| <i>Flowers scattered, apetalous, tubular, hermaphrodite. Leaves marked with both round and linear transparent dots. (Stamens perigynous) . . . . .</i>   | } | 112. SAMYDACEÆ.      |
| <i>Flowers polypetalous or apetalous, coronetted. Petals perigynous, imbricated. Stamens on the stalk of the ovary. Styles simple, terminal. Seeds arillate. Leaves stipulate . . . . .</i>                |   | 113. PASSIFLORACEÆ.  |
| <i>Flowers polypetalous, coronetted. Petals perigynous, imbricated. Stamens on the stalk of the ovary. Styles simple, dorsal. Seeds without aril. Leaves without stipules . . . . .</i>                    | } | 114. MALESHERBIACEÆ. |
| <i>Flowers polypetalous. Calyx many-leaved. Petals perigynous. Anthers 1-celled. Fruit stipitate, consolidated, siliquose. Seeds without albumen (Stamens perigynous) . . . . .</i>                        |   | 115. MORINGACEÆ.     |
| <i>Flowers polypetalous. Calyx many-leaved. Petals hypogynous. Stamens all perfect; anthers crested, and turned inwards. Fruit consolidated. Seeds albuminous . . . . .</i>                                | } | 116. VIOLACEÆ.       |
| <i>Flowers polypetalous. Calyx tubular, furrowed. Petals hypogynous, unguiculate . . . . .</i>   |   | 117. FRANKENIACEÆ.   |
| <i>Flowers polypetalous. Calyx many-leaved. Petals hypogynous. Styles distinct. Fruit consolidated. Seeds 00, basal, comose, without albumen. . . . .</i>  | } | 118. TAMARICACEÆ.    |
| <i>Flowers polypetalous. Calyx many-leaved. Petals hypogynous. Stamens partly sterile and petaloid; anthers opposite the petals, naked, turned outwards. Fruit consolidated. Seeds albuminous. . . . .</i> |   | 119. SAUVAGESIACEÆ.  |
| <i>Flowers polypetalous or monopetalous. Calyx many-leaved. Petals hypogynous. Fruit follicular, apocarpous . . . . .</i>  | } | 120. CRASSULACEÆ.    |
| <i>Flowers polypetalous. Petals perigynous, contorted. Styles forked. Leaves exstipulate . . . . .</i>   |   | 121. TURNERACEÆ.     |



ORDER CX. FLACOURTIACEÆ.—BENNETT.

*Flacourtia* *Indica* in *Mém. Mus. 1. 306* (1816); *Bot. Beech.* 1. 225; *Flora Indica*, 3. 36; *Encycl. Bot.* 2. 487; *Passifloraceæ*, *Pé.* 2. 1—*Blumea*, *Blume*, *Ann. Bot.* 1. 17 (1822); *Bot. Beech.* 1. 225; *Flora Indica*, 3. 36—*Bixada*, *Ed. p. 171* (1825); *Blumea*, *Blume*, *Ann. Bot.* 1. 17 (1822).

**DIAGNOSIS.**—*Woody Climber, with scattered axillary or subterminal flowers, hypogynous petals and stamens, and dotted or punctate leaves.*

Shrubs or small trees. Leaves alternate, simple, on short stalks, without winged axillary, many-flowered. Sepals from 4-7, coloring slightly at the base. Petals equal to the latter in number and alternate with them, or wanting. Stamens hypogynous, of the same number as the petals, or twice as many, or some multiple of them. Ovary roundish, sessile, or slightly stalked, free, 1 or more celled, with 2 or more parietal placentæ, which are either simple or branched; style either none or filiform; stigmas several, more or less distinct; ovules attached to the surface or sides of the placentæ, and never to the axis in those genera whose ovary has several cells. Fruit 1-celled, either fleshy and indehiscent, or capsular, with 4 or 5 valves, the centre filled with a thin pulp. Seeds 00, usually enveloped in a pellicle formed by the withered pulp; albumen fleshy, somewhat oily; embryo straight, in the axis, with the radicle turned to the hilum, and therefore usually superior; cotyledons flat, foliaceous.

The two supposed Natural Orders now brought together, as suggested by several writers, and especially by Mr. Bennett and Professor Endlicher, have never possessed any valid claim to be distinguished. The differences between them were derived from the mode of placentation, which in *Bixa* and its allies is parietal in lines, while in *Flacourtia* it spreads like a net over the inner surface of the fruit. But intermediate structures annul this characteristic. It was also supposed that the presence among the allies of *Flacourtia* of certain barren stamens or scales, would assist in dividing the latter from *Bixa*,—in fact, establishing a direct affinity between the first and *Passifloraceæ*; but those scales belong to genera now referred to *Pangidiæ*. Taken as a Natural Order, *Bixads* form a group totally distinct from *Sapoteæ* by their hypogynous stamens and dotless leaves, or at least by the latter being present if they are present; from *Passifloraceæ* by the petals of passing being hypogynous, and the total absence of all sign of a corolla. Besides, as they include stamens, and the valvate calyx of some genera, they have been compared to *Limnæaceæ*; but there



FIG. CXXIV.

FIG. CXXIV.—*Bixa indica*.—1. A flower and the ovary; 2. a transverse section of the ovary; 3. a single seed; 4. a cross-section of a fruit.



seems to be only a remote analogy with that Order. The frequent tendency to a polygamous structure shows their affinity to Lacistemads.

Almost all these plants are natives of the hottest parts of the East or West Indies, and Africa. Two or three species are found at the Cape of Good Hope, and one or perhaps two in New Zealand.

The pulp of *Oncoba* is sweet, and eaten in Nubia. The fruits of some of the *Flacourtias* are eatable and wholesome. Those of *F. Ramontchi*, a Madagascar species, are much like black plums; of *F. sapida* and *sepiaria* have a pleasant refreshing subacid taste; and the berries of a species of *Roumea*, found in the jungles of Ceylon, are much prized at Colombo. The young shoots and leaves of *Flacourtia cataphracta*, which have the taste, but not the bitterness, of Rhubarb, are considered astringent and stomachic, and are prescribed, in the Circars, in cases of diarrhœa and general debility; in Bahar, a cold infusion is used in hoarseness. The infusion of *F. sepiaria* is considered useful in bites of snakes; the bark rubbed with oil, and made into a liniment, is employed against gout on the Malabar coast.—*Wight*. *Aphloia theiformis*, a shrub inhabiting the Isle of France, has an emetic bark. *Lætia apetala* secretes in tropical America a balsamic resin, becoming white in contact with air, like Sandarach.

The seeds of *Bixa Orellana* are angular, and covered with an orange-red waxen pulp or pellicle. The latter substance is the Arnotto of the shops; it is separated from the seeds by washing. It is chiefly used in the preparation of chocolate; but was reckoned an antidote to the poison of the manioc or *Janipha Manihot*. Farmers employ it to stain their cheeses, and dyes for a reddish colour. Martius says that the seeds are cordial, astringent, and febrifugal.

#### GENERA.

I.— <i>Bixere</i> . <i>Style simple</i> . <i>Fruit splitting</i> .	<i>Rhinanthera</i> , Blum. <i>Limonia</i> , Gärtn. <i>Scolopia</i> , Schreb. <i>Eriudaphus</i> , Nees. <i>Dasyanthera</i> , Presl. <i>Ludia</i> , Lam. <i>Laetia</i> , Löffl. <i>Thamnia</i> , P. Br. <i>Hellwingia</i> , Adans. <i>Prockia</i> , P. Br.	<i>Bosca</i> , Fl. Flum. <i>? Xyladenus</i> , Desv. <i>Azara</i> , Ruiz et Pav. <i>Kuhlia</i> , H. B. K. <i>Lilania</i> , Bert. <i>Almeja</i> , Endl. <i>Pineda</i> , Ruiz et Pav. <i>Christannia</i> , Presl.	<i>Cræpaloprumnon</i> , Endl. <i>Roumea</i> , Poit. <i>Koelera</i> , Willd. <i>Bessera</i> , Spreng. <i>Limacia</i> , Dietr. <i>Hisingera</i> , Hellen. <i>Xylosma</i> , G. Forst. <i>Myroxylon</i> , J. R. Forst. <i>Lunania</i> , Hook.
II.— <i>Prockere</i> . <i>Style simple</i> . <i>Fruit not splitting</i> .	<i>Thiodia</i> , Benn. <i>Lightfootia</i> , Swartz. <i>Aphloia</i> , Benn. <i>Neumannia</i> , A. Rich. <i>Xylothea</i> , Hochst. <i>Ascara</i> , Schott. <i>Trilix</i> , L. <i>Zuelania</i> , A. R. <i>Banara</i> , Aubl.	III.— <i>Flacourteæ</i> . <i>Styles or stigmas several</i> , <i>Fruit succulent</i> . <i>Flacourtia</i> , Commers. <i>Stigmarota</i> , Lour. <i>Rhamnopsis</i> , Reichenb.	IV.— <i>Erythrospermeæ</i> . <i>Styles several</i> . <i>Fruit splitting</i> . <i>Kiggellaria</i> , Linn. <i>Erythrospermum</i> , Lam. <i>? Tachibota</i> , Aubl. <i>Salmasia</i> , Schreb.

NUMBERS. GEN. 31. Sp. 65.

*Pangiacæ*.

POSITION.—*Samydaceæ*.—*FLACOURTIACEÆ*.—*Lacistomaceæ*.

*Tiliacæ*??

#### ADDITIONAL GENERA.

*Aberia*, Hochst.  
*Monospora*, Hochst. near *Erythrospermum*.  
*Doryalis*, E. Meyer.



Order CXL. LACISTEMACEÆ.—LACISTEMACEÆ.

Linnaeus, *Methus.* N. G. *et Sp.* Pl. 1, 164 (1824). *Bot. suec.* 1, 188, p. 37.

Diagnosis. *Radial Eucorææ*, with *crustaceous* softly opening *polygamous flowers*, and *unilateral stamens*.

Small trees or shrubs. Leaves simple, alternate, with stipules. Flowers 2-angled, clustered axillary catkins, ♂, or ♀, by abortion. Calyx in several narrow divisions, free, covered over by a dilated bract. Corolla vanishing. Disk somewhat fleshy, surrounding the stamens, or in front of them, sometimes hardly visible. Stamen 1, hypogynous, standing on one side of the ovary, with a thick 2-lobed connective, at the apex of each of whose lobes is placed a single cell of an anther, bending transversely. Ovary superior, seated in a fleshy disc, 3-celled, with several anatropal ovules attached to 3 spermatophyllæ; stigmas 2 or 3, sessile or on a style. Fruit capsular, 1-celled, splitting into 2 or 3 valves, each of which bears a placenta in its middle. Seed usually, by abortion, one to each valve, suspended, with a fleshy aril; integument crustaceous; albumen fleshy; embryo inverted, with placotyledons and a superior straight cylindrical radicle.

Von Martius, the founder of this Order, which he divides from Nettleworts, speaks of it thus: "The peculiar character consists in the presence of a distinct perianth, while the amenaceous inflorescence is an indication of an affinity with apetalous Orders of a lower grade." The same

Botanist indicates its relation to Chloranthus in the structure of the filament, and to Samyds in that of the fruit. "The monadelphous stamens of both which may be perhaps considered a higher kind of evolution of the fleshy disk in the bottom of the flower of Lacistema." In habit the species are said to be something like Peppers, but more aromatic. To me, however, they look much more like Casarinas with an amentaceous inflorescence, and they might easily be mistaken for them, when not in flower. They differ, however, from Samyds in their leaves not being dated, in their rarely not perfect tubular and half-coloured, calyx, and their constant unilateral stamens. No doubt they are a transition form from the more perfect to the diaphanous Orders, as is sufficiently indicated by their polygamous flowers.

Natives of low places in woods in equinoctial America.

Their properties are unknown.

GENERA

*Samydanthus*, *Reich. et Pres.*  
*Desmanthus*, Willd.

*Lacistema*, Martius.  
*Desmanthus*, F. C. Hoffm.

NUMBERS. GEN. 2. Sp. 3.

*Pyramis*.

POSITION.

LACISTEMACEÆ.—Samyds.

*Desmanthus*.

Fig. CCXXV. *Lacistema cylindricum*—Martius. 1, anthesis in flower; 2, pistil and calyx; 3, pistil and calyx; 4, fruit in its state of dolorescence.



## ORDER CXII. SAMYDACEÆ.—SAMYDS.

*Samydeæ*, *Vent. Mem. Inst.* 2. 142. (1807); *Gærtn. fil. Carp.* 3. 238. 242. (1805); *Kunth. Nov. Gen.* 5. 360. (1821); *DC. Prodr.* 2. 47. (1825); *Endl. Gen. exciv.*; *Meisn. p.* 72.

**DIAGNOSIS.**—*Violal Exogens*, with scattered apetalous tubular hermaphrodite flowers, perigynous stamens, and both round and linear transparent dots in the leaves.

Trees or shrubs. Leaves alternate, often somewhat distichous, simple, entire or toothed, evergreen, with stipules, usually with pellucid markings, which are both linear and oblong. Peduncles axillary, solitary, or numerous. Sepals 4-5, more or less co-

hering at the base, usually coloured inside; æstivation somewhat imbricated, very seldom completely valvate. Petals 0. Stamens arising from the tube of the calyx, 2, 3, or 4 times as many as the sepals; filaments monadelphous, either all bearing anthers, or alternately shorter, villous or ciliated, and alternately bearing ovate 2-celled erect anthers. Ovary superior, 1-celled; style 1, filiform; stigma capitate, or slightly lobed; ovules 00, attached to parietal placenta, ascending, half anatropal. Capsule coriaceous, with 1 cell and from 3 to 5 valves, many-seeded, the valves dehiscing imperfectly, often somewhat pulpy inside, and coloured. Seeds fixed to the valves, without order, on the papillose or pulpy part, with a fleshy aril and excavated hilum; albumen oily or fleshy; embryo large, in the middle of it; cotyledons ovate; radicle pointing to the extremity remote from the hilum.

This Order, although petals are unknown in it, was placed in Polypetalous Exogens by De Candolle, who regarded a petaloid layer covering the inner surface of the sepals as analogous to a corolla. Although this cannot be admitted as true, yet it may be taken as evidence of a tendency to assume a corolline state. According to authors its apetalous flowers and parietal placentation approximate it to Bixads, its dotted leaves to Amyrids, near which De Candolle stations it, and its perigynous stamens to Roseworts, with which its alternate stipulate leaves also ally it. Its fruit, as in *Casearia parviflora*, is sometimes remarkably like that of Violetworts. In habit the Order approaches *Smeathmannia* among Passionworts. The difficulty of coming to any satisfactory conclusion in this matter, arises from the stamens having a manifestly perigynous insertion; and if this circumstance is to be re-



Fig. CCXXVI.

garded as of the usual importance, it is certain that Samyds have no title to a place among the Violal Alliance. If, however, we regard it as exceptional in the present instance, we then find the Order very naturally associated, by the force of all its other characters, with those among which it is now placed. Its composite fruit, with distinct parietal placentation, is much the same as that of many Bixads on the one hand, and of Lacistemads on the other; and its sterile stamens appear to offer a plain indication of a tendency to acquire the coronetted structure of Passionworts. Brown observes, that Samyds are especially distinguished by their leaves having a mixture of round and

Fig. CCXXVI.—*Casearia grandiflora*.—A. St. Hilaire. 1. part of a calyx split open; 2. the pistil half grown; 3. section across the ovary; 4. section of seed; 5. seed; 6. aril, removed from the seed.



linear pellucid dots, which distinguish them from all the other families with which they are likely to be confounded.

Samyds are all tropical and principally American. Little is known of the African or Asiatic species.

The bark and leaves are said to be slightly astringent. In Brazil the leaves of *Cassarea ulmifolia* are applied to wounds, and their juice is drunk by the sick. It is said to be a most certain remedy against the bite of the most rascally serpents, and is called *Marmaleiro do Mato*. A decoction of the leaves of *Cassarea ligua*, called by the Brazilians *Cha de Frade* and *Lingua de Pin*, is also used internally as a febrifuge in fevers and malignant fevers. *Cassarea astringens* bark is nitiduliglossa and somewhat astringent; it is used in Brazil as a poultice or lotion for badly headed ulcers, and is said by Martins to be wonderfully efficacious as a cleanser and stimulant of the raw flesh. *Cassarea Anavinga*, an Indian species, is bitter in all its parts; the leaves are used in medicated baths; the pulp of the fruit is very diuretic. The root of *Cassarea occidentalis* is bitter and purgative; but its foliage is eatable.

GENERA.

<i>Samyda</i> , Lam.	<i>Alouatta</i> , Rheed	<i>Pometia</i> , Aubl.	<i>Cyathia</i> , Poir.
<i>Gyneria</i> , Lam.	<i>Passiflora</i> , Aubl.	<i>Melastomum</i> , Pers.	<i>Lindleya</i> , Kunt.
<i>Cassarea</i> , Jacq.	<i>Lampyris</i> , Scop.	<i>Fraxinea</i> , Aubl.	<i>Passiflora</i> , Sp. Pl.
<i>Passiflora</i> , L. Frum.	<i>Alouatta</i> , Scop.	<i>Chamaecrista</i> , R. & P.	<i>Candollea</i> , HBK.
<i>Dryandra</i> , Endl.	<i>Alouatta</i> , Desfont.		<i>Passiflora</i> , Pers.

NUMBERS. GEN. 5. Sp. 110

*Humboldtia*.

POSITION.—Passifloraceæ.—SAMYDACEÆ.—Flacourtiaceæ.



## ORDER CXIII. PASSIFLORACEÆ.—PASSIONWORTS.

Passifloreæ, *Juss. Ann. Mus.* 6. 102. (1805); *Id. Dict. des Sciences Nat.* 38. 48.; *DC. Prodr.* 3. 321; *Achille Richard Dict. Class* 13. 95. (1828); *Endl. Gen.* cxcvii.; *Meisner, Gen.* p. 124.

DIAGNOSIS.—*Violal Exogens*, with polypetalous or apetalous coronetted flowers, perigynous imbricated petals, stamens on the stalk of the ovary, simple terminal styles, arillated seeds, and stipulate leaves.

Herbaceous plants or shrubs, usually climbing, very seldom erect. Leaves alternate, with foliaceous stipules, often glandular. Flowers axillary or terminal, often with a 3-leaved involucre. Sepals 5, sometimes irregular, combined in a tube of variable

length, the sides and throat of which are lined by filamentous or annular processes, apparently metamorphosed petals. Petals 5, arising from the throat of the calyx, on the outside of the filamentous processes, occasionally wanting, sometimes irregular, imbricated in æstivation. Stamens 5, monadelphous, rarely indefinite, surrounding the stalk of the

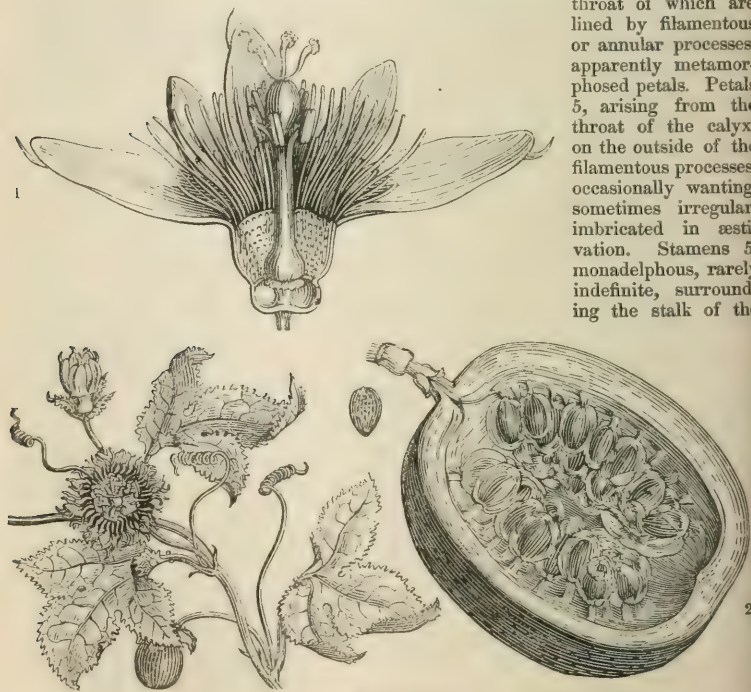


Fig. CCXXVII.

ovary; anthers turned outwards, linear, 2-celled, bursting longitudinally. Ovary seated on a long stalk, superior, 1-celled; styles 3, arising from the same point, clavate; stigmas dilated; ovules 00, anatropal, parietal, often inserted on long stalks. Fruit stalked, 1-celled, with 3 parietal polyspermous placentæ, sometimes 3-valved. Seeds attached in several rows to the placentæ, with a brittle sculptured testa surrounded by a pulpy aril; embryo straight, in the midst of fleshy thin albumen; radicle turned towards the hilum; cotyledons flat, leafy.

The real nature of the floral envelopes of this remarkable Order is a question upon which Botanists entertain different opinions, and their ideas of its affinities are consequently at variance. According to Jussieu (*Dict. des Sciences*, 38. 49.), the "parts

Fig. CCXXVII.—*Passiflora*; 1. section of a flower; 2. of its ripe fruit.



taken for petals are nothing but inner divisions of the calyx, usually in a coloured zone, and wanting in several species; and, therefore, in the judgment of that venerable Botanist, the Order is apetalous. De Candolle adopts the same view of the nature of the floral envelopes as Jussieu; but he nevertheless considers the Order polypetalous; a conclusion which I confess myself unable to understand, upon the supposition of the inner series of floral envelopes being calyx. Other Botanists, and I think with justice, consider the outer series of the floral envelopes as the calyx, and the inner as the corolla, for two principal reasons. In the first place, they have the ordinary position and appearance of calyx and corolla, the outer being green, and the inner coloured; and, in the second place, there is no essential difference between the calyx and corolla, except the one being the outer, and the other the inner of the floral envelopes. And if the real nature of these parts is to be determined by analogy, an analogy in which I do not, however, concur, the great affinity, as I think, of the Order with Violaceæ, would confirm the idea of its being polypetalous rather than apetalous. The nature of the filamentous appendages, or coronet, or rays as they are called, which proceed from the orifice of the tube, and of the membranous or fleshy, entire or lobed, flat or pleated, annular processes which lie between the petals and the stamens, is ambiguous. I am disposed to refer them to a peculiar form of petals, rather than to the stamens, for the reasons which I have assigned in the *Hort. Trian.* vol. 6, p. 509, for understanding the normal metamorphosis of the parts of fructification to be centripetal. There can, at least, be no doubt of their being of an intermediate nature between petals and stamens. With regard to the affinity of Passionworts, Jussieu, swayed by the opinion he entertained of their being apetalous, and De Candolle, who partly agreed and partly disagreed with Jussieu in his view of their structure, both assigned the Order a place near Cucurbits, and there can be doubt that Cucurbits are really little more than Passionworts with separate sexes and inferior fruit; but when we consider the stipitate fruit, occasionally valvular, the parietal placentæ, the sometimes irregular flowers, the stipulate leaves, and the climbing habit of these plants, it is difficult not to admit their greater affinity with Capparids or Violetworts, the dilated disk of the former of which is probably analogous to the innermost of the annular processes of Passiflora. That the fleshy covering of the seeds in this Order is a real aril, is clear from the seeds of a capsular species nearly related to *P. capsularis*, a drawing of which, by Ferdinand Bauer, exists in the Library of the Horticultural Society. In this plant the apex of the sculptured testa is uncovered by the aril. *Smeathmannia* forms a connecting link between Passionworts and Samyds.

Crownworts (*Malesherbiaceæ*) are perhaps not very distinct; their differences, such as they are, are noticed in the proper place. Passionflowers are the pride of South America and the West Indies, where the woods are filled with their species, which climb about from tree to tree, bearing at one time flowers of the most striking beauty, and of so singular an appearance, that the zealous Catholics who discovered them, adapted Christian traditions to those inhabitants of the South American wilderness; and at other times fruit, tempting to the eye and refreshing to the palate. One or two extend northwards into North America. Several are found in Africa and the neighbouring islands; and a few in the East Indies.

As far as we have any knowledge of the uses of these plants they appear, notwithstanding their eatable fruit, to possess active and rather dangerous qualities. *Passiflora quadrangularis*, whose fruit is the great Granadilla sometimes seen in our herbaceous, has an emetic root (*Mentha*), and is powerfully narcotic, on which account it is said by Mr. Burnett, on the authority of a French writer, to be cultivated in several French establishments for the sake of its root. It is said to owe its activity to a principle called Passiflorine. *P. Contrayerva* is said to be alexipharmic and carminative. According to Browne, a tincture of the flowers of *P. rubra*, formed by infusion in wine or spirits, is used in the lower parts of Jamaica, under the name of Dutchman's Laudanum, as a safe narcotic. *P. foetida*, and some allied species, are esteemed as emmenagogue, and are thought to be serviceable in dysentery; the infusion of the flowers is also taken as a pectoral medicine in the West Indies. The juice is used in Brazil in poultices, against erysipelas and inflammatory eruptions of the skin. The bitter and astringent leaves of *P. karfiolia* have some reputation as antihelmintics. *P. pallida*, *malinensis*, and *inermis* are employed in cases of intermittent fevers. *Murceya ocellata*, a West Indian climber, is said to be antihelmintic, diaphoretic, and antilysteric. Among the species whose fruit is eaten, the most important are *Passiflora filamentosa*, *pallida*, *lutea*, *cucurbita*, *caerulea*, *cupifolia*, *whitii*, *incarnata*, and *serrata*, *Tacsonia mollissima*, *tripartita* and *speciosa*, and the Malagasy shrub called *Paropsia edulis*.



## GENERA.

Ryania, <i>Vahl.</i>	Passiflora, <i>Juss.</i>	Granadilla, <i>DC.</i>	Tacsonia, <i>Juss.</i>
Patrisia, <i>L. C. Rich.</i>	Granadilla, <i>Tournef.</i>	Anthactinia, <i>Bory.</i>	Distephana, <i>Juss.</i>
Smeathmannia, <i>Sol.</i>	Cieca, <i>Medik.</i>	Dysosmia, <i>DC.</i>	Distephia, <i>Salisb.</i>
Bulowia, <i>Schum.</i>	Astephananthes, <i>Bory.</i>	Astropheia, <i>DC.</i>	? Vareca, <i>Gärtn.</i>
Paropsia, <i>Norouh.</i>	Momactineirma, <i>Bory.</i>	Murucuja, <i>Tournef.</i>	Crossostemma, <i>Planch.</i>
Thompsonia, <i>R. Br.</i>	Baldvina, <i>Raf.</i>	Disemma, <i>Labill.</i>	Tetraphæa, <i>DC.</i>
Deidamia, <i>Thouars.</i>	Decaloba, <i>DC.</i>		

NUMBERS. GEN. 12. Sp. 210.

*Papayaceæ.*

POSITION.—Samydaceæ.—PASSIFLORACEÆ.—Malesherbiaceæ.

*Capparidaceæ.*

The *Passiflora tetrandra* of Banks, or *Tetraphæa australis* of Raoul, is remarkable for being polygamous, or even diœcious.



## ORDER CNIV. MALESHERBIACEÆ. — CARYOPHYTES.

Malesherbiaceæ. *Don in Dameson's Journal*, 321. 1826; *Ed. in V. & P. Phil. Mag. Zool.*, 1826; *Willd. Bot. p. 146*. — *Passifloracæ*, & *Malesherbiacæ*, *DC. Prodr.* 3. 27. 1828.

DIAGNOSIS. — *Woody Leopards*, with polypetalous, somewhat fleshy, persistent membranous petals, standing on the stalk of the ovary, simple diverg'd styles, anthers without tail, and leaves without stipules.

Herbaceous or half-shrubby plants. Leaves alternate, lobed, without stipules. Flowers axillary or terminal, solitary, yellow or blue. Calyx tubular, membranous, inflated, 5-lobed, the lobes with an imbricated aestivation. Petals 5, alternate with the segments of the calyx, persistent, with a convolute aestivation, arising from without a short membranous rim or coronet. Stamens 5 or 10, perigynous; filaments filiform, distinct, or connected with the stalk of the ovary; anthers versatile. Ovary superior, stipitate, 1-celled, with parietal placentæ; ovules 00, pendulous, anatropal; styles 3, filiform, very long, arising from distant points of the apex of the ovary; stigmas clavate. Fruit capsular, 1-celled, 3-valved, membranous, more or less many-seeded. Seeds attached to placentæ arising either from the axis of the valves, or from their base; testa brittle, with a fleshy crest, and no aril; embryo taper, in the midst of abundant fleshy albumen, with the radicle next the hilum.

According to Don, by whom these plants were first considered the rudiments of an Order, "they agree on the one hand with Passionworts, and on the other with Turners; and I am persuaded that this is their true position." From the former they differ in the insertion of their styles at the back, not on the apex of the ovary, in their taper embryo, want of aril and of stipules, and altogether in their habit: from Turners, to which their habit quite allies them, they differ in the presence of a membranous coronet within the petals, in the remarkable insertion of the styles, and in the want of all trace of an aril. In their thin-seed'd fruit they approach *Snoethamnia* in Passionworts. Their tubular, somewhat furrow'd calyx is not altogether different from that of *Frankenias*.

All are natives of Chili and Peru.

Their uses are unknown.

## GENERA.

*Malesherbia*, *Rom. et Pass.* 1. — *Caryophana*, *DC.*



FIG. CCXXXV.

NUMBERS. GEN. 2. SP. 1.

POSITION. — TURNERACEÆ. MALESHERBIACEÆ. — CARYOPHYTES.

FIG. CCXXXIII. — *Malesherbia frutescens*. 1. A single petal. 2. A part of the coronet, showing 2 petals and a portion of the coronet. 3. The interior of the ovary. 4. A longitudinal section of the fruit.



## ORDER CXV. MORINGACEÆ.—MORINGACEÆ.

Moringeæ, *R. Brown in Denham*, p. 33. (1826); *Barth. Ord. Nat.* 425. (1830); *Decaisne in Ann. Sc. N. S.*, 4. 203. (1835); *Endl. Gen.* p. 1321.; *Meisn. Gen.* p. 78.; *Wight and Illustr.* 1. f. 77.

**DIAGNOSIS.**—*Violæ Exogens*, with a many-leaved calyx, perigynous petals and stamens, 1-celled anthers, stipitate consolidated siliquose fruit, and exalbuminous seeds.

Trees, with 2-3-pinnated leaves, whose leaflets very readily drop off, and thin, deciduous, coloured stipules. Flowers irregular, white, in loose panicles. Sepals 5, petaloid, nearly equal, deciduous; the tube lined with a fleshy disk; æstivation slightly imbricated. Petals 5, visibly unequal, the uppermost of which is ascending. Stamens 8 or 10, arising from the top of a disk lining the tube of the calyx; 5 opposite the sepals, sometimes sterile; filaments slightly petaloid, callous and hairy at the base; anthers simple, 1-celled, with a thick convex connective. Ovary stipitate, superior, 1-celled, with 3 parietal placentæ bearing numerous suspended anatropal ovules; style filiform, terminal, obliquely recurved; stigma simple. Fruit a long pod-like capsule, with 3 valves, and only 1 cell; the valves bearing the seeds along their middle. Seeds numerous, half buried in the fungous substance of the valves, sometimes winged; embryo amygdaloid, without albumen; radicle straight, superior (turned to the hilum), very small; cotyledons fleshy, plano-convex.

This is a little group of small trees, with an appearance so peculiar that one hardly knows with what to compare them. It however seems generally admitted that they resemble some plants of the Leguminous Order; and it is to the vicinity of those that all Botanists, except myself, seem agreed in referring them, moved thereto by their pinnated leaves, with glands between the leaflets, declinate decandrous perigynous stamens, and pod-like fruit. De Candolle, who did not overlook the anomalous structure of *Moringa* as a Leguminous plant, accounted for the compound nature of its fruit upon the supposition, that although unity of carpels is the normal structure of Leguminosæ, yet the presence of more ovaries than one, in a few instances in that Order, explained the constantly trilocular state of that of *Moringa*. It has, however, always seemed to me that the resemblance which Botanists have found with the Leguminous Order are trifling, while the discrepancies are of the first importance. For example, the habit of the plant consists in a doubly pinnated foliage, which would do as well for Roseworts, or Citronworts, or Rueworts; the declinate stamens may be found in Rueworts, Milkworts, Capparids, and many others; and as to the pod-like form of the fruit, it is not worth a thought. The objections are, that the sepals are of the same texture as the petals, the anthers 1-celled, the ovary composed of 3 carpels which have not the power of turning inward their sides so as to form dissepiments, and that the attachment of the carpels is strictly parietal. It is true that the latter circumstance will not be so much at variance

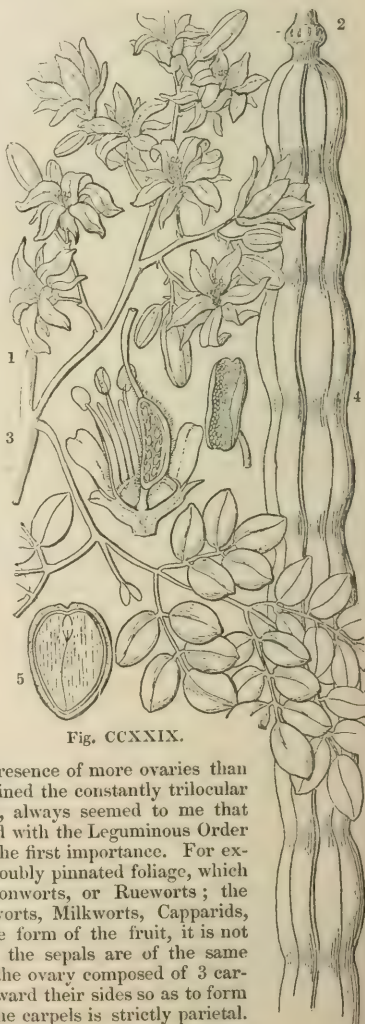


Fig. CCXXIX.

Fig. CCXXIX.—1. *Moringa pterygosperma*. 2. its fruit; 3. the section of a flower of *M. aptera*; 4. its anther; 5. a section of its seed.—*Wight and Decaisne*.



with the Leguminous structure as it appears to be. If it should be proved that axillary and parietal placentation are of the same nature, which seems to be the fact; but connected as it is with the other pointed differences, and considering that it is pointed placentation in excess, it appears to be of considerable moment. This has already led me to regard the Moringaceæ as a member of some great parietal Alliance, and as somewhat of a nearer affinity with Violetworts than with any other Order; and to this opinion I adhere, for the following reasons: the stamens are didymous in number, the corolla is manifestly irregular, the placentation is parietal, and the flowers are not leucous, the parts of the fruit being 3, while those of the calyx, corolla, and stamens are 5. The main objection to this view is derived from the stamens being perigynous; and it will be seen from the altered arrangements introduced into the present volume, that I now attach much more importance to that circumstance than formerly. But it must be remembered that Moringa is not at all more perigynous than Vernacularia and others among Malpighiads, or than Rosella among the Cniffeers, or than Escholtzia among Poppyworts; and that, in fact, it may be very well regarded as standing in the same relation to Violetworts as Escholtzia to Poppyworts. While, however, the parietal placentation seems to turn the scale in favour of the near affinity of Moringaceæ to Violetworts, there can be little doubt that they also approach the anisomerous Sapindal Alliance, especially Milkworts, in their declinate stamens, 1-celled anthers, and petaloid calyx.

The species are natives of the East Indies and Arabia.

The root of the *Moringa pterygosperma* has a pungent odour, with a warm, biting, and somewhat aromatic taste, very like Horseradish; it is used as a stimulant in paralytic affections and intermittent fever; it is also employed as a rubefacient. Dr. Wight suggests that it would greatly increase the activity of simpisims. He adds that a large quantity of gum, resembling Tragacanth, exudes from wounds in the bark. The seeds of this plant, called by the French *Pois Queniques* and *Chicot*, have been used in venereal affections. They are the Ben-nuts of old writers, from which the oil of Ben was extracted, formerly more famed than at present. It is chiefly used by perfumers as the basis of various scents, and by watchmakers, because it does not readily freeze. The flowers, leaves, and tender seed-vessels, are eaten by the natives of India in their curries.

#### GENERA.

*Moringa*, Lamour.  
*Hippocadista*, Forsk.

*Adansia*, Lamour.  
*Hippocadista*, Swartz.

*Aradibia*, Swartz.  
*Adansonia*, Lamour.

#### NUMBERS, GEN. I. Sp. I.

POSTERIOR ————— *Palmaria*,  
MORINGACEÆ. — *Vinhosa*,  
*Polygala*.



## ORDER CXVI. VIOLACEÆ.—VIOLETWORTS.

Violariæ, DC. *Fl. Fr.* 4. 801. (1805); *Juss. Ann. Mus.* 18. 476. (1811); DC. *Prodr.* 1. 287. (1824); *Bartl. Ord. Nat.* 283. (1830); *Endl. Gen. exc.*; *Meisner Gen.* 20; *Wight Illustr.* 1. 142.—Violacæ, *Lindl. Synops.* 35. (1829.)

**DIAGNOSIS.**—*Violal Exogens*, with polypetalous flowers, a many-leaved calyx, hypogynous petals, stamens all perfect, anthers crested and turned inwards, consolidated fruit, and albuminous seeds.

Herbaceous plants or shrubs. Leaves simple, usually alternate, sometimes opposite, stipulate, with an involute vernation. Inflorescence various. Sepals 5, persistent, with



Fig. CCXXX.



Fig. CCXXXI.



Fig. CCXXXII.

an imbricate æstivation, usually elongated at the base. Petals 5, hypogynous, equal or unequal, usually withering, and with an obliquely convolute æstivation. Stamens 5, alternate

with the petals, occasionally opposite them, inserted on a hypogynous disk, often unequal; anthers 2-celled, bursting inwards, either separate or cohering, and lying close upon the ovary; filaments dilated, lengthened beyond the anthers; two, in the irregular flowers, generally furnished with an appendage or gland at their base. Ovary 1-celled, many-seeded, or rarely 1-seeded, with 3 parietal placentæ opposite the

3 outer sepals; style single, usually declinate, with an oblique hooded stigma; ovules anatropal. Capsule of 3 valves, bearing the placentæ in their axis. Seeds 00, or definite, roundish or winged, often with a tumour at their base; embryo straight, erect, in the axis of fleshy albumen.

The Violetworts are distinctly defined by their definite stamens, whose anthers turn inwards, and extend their connective into a crest; but the irregularity of their flowers,

Fig. CCXXX.—*Corynostylis Hybanthus*. 1. a set of stamens, each having the connective lengthened beyond the anther, in the form of a seale; 2. a spurred petal; 3. a transverse section of an ovary, showing the three parietal placente. 4. a ripe fruit; 5. an embryo.

Fig. CCXXXI.—Side view of the flower of *Viola tricolor*.

Fig. CCXXXII.—Its fruit.



although a very common circumstance, is a more possibility of common genera. Some Roses (Cistaceæ), by some associated with these, are very different by their andro-stamens, curled embryo, and orthotripod ovules. So also the Sandwies (Dioscoreæ), another race to which they approach, are far separated by their tripartite bractes, at the midst of profuse attention, by their numerous stamens, carinate lower, and want of similar Pedicels, to which the lacinate genera of Violaceæ, and especially *Caryocarpus* (*Calyptrois*, *DC.*), which has a taining stem, undisturbedly approach, are distinguished by a multitude of characters, among the more striking of which are their general difference to the tube of the calyx and the long stalk of the ovary.

Of the two Suborders recognised among these plants, *Viola* mostly consists of European, Siberian, and American plants; a few only being found within the tropics of Asia. They are abundant in South America, where the forms are, however, materially different from those of the more temperate parts of the world, most of the species being shrubs, while the northern *Viola*s are uniformly herbaceous, or nearly so. *Anchieten* are exclusively South American and African, with the exception of *Pentstemon*, which belongs to the Malayan Flora.

The roots appear to be more or less emetic, a property which is strongly possessed by the South American species, and in a less degree only by those of Europe. Hence the form part of the herbs known under the name of *Ipsocnemides*. *Anchieten parviflorum*, and others, called *Cuchamelina* in Peru, are violent purgatives and emetics, and have great reputation as a cure for the disease called *Cuscuta*, in Jamaica, or *Mal de St. Louis* in Spanish America, the *Elephantiasis tuberculata*; they are used by the Spanish Americans, and I. Poaya by the Brazilians, as a substitute for *Ipsocnemides*. The root of another species called *Poaya*, *Poaya de praia*, and *Poaya branca*, the *Indigum Indis* of Kunth, is commonly sold as true *Ipsocnemides*, to which it approaches very nearly in its properties; at Pernambuco it is esteemed the very best remedy that can be employed in dysentery; and the inhabitants of Rio-Grande-do-Norte consider it a specific against scurvy. The foliage of the *Conohoria Lobolobo* is used in Brazil for the same purposes as Spinach with us. Boiled, it becomes unelaginous. *Viola canina* is reported a powerful agent for the removal of cutaneous affections; and *Anchieten latioris*, a creeping herb, with the smell of Cabbage, and a nauseous taste, is accounted by the Brazilians not only a purgative, but also a remedy against similar maladies. A. de St. Hilare remarks, that this notion deserves attention, as connected with the depurative properties ascribed to Europe to *Viola canina*, of which, although *Anchieten* is botanically related to it, there is nothing in the appearance which would have led the Portuguese settlers to attribute the virtues of the one to the other. The petals of *Viola odorata* are used as a lavative for children, one drachm operating pretty freely; the seeds possess similar properties, the root is emetic and purgative. The aqueous tincture of the flowers is a useful chemical test: uncombined acids changing the blue to red and alkalis to green. The Romans used a wine made of violet flowers, and it is said they are still used in the preparation of the Grand Signor's sherbet. By some the flowers are considered antiseptic; they certainly induce faintness and giddiness in particular constitutions, as I have witnessed. Volney mentions a case in which they produced apoplexy. When bruised, the leaves of *Viola* are color smell like Peach kernels, hence they have been supposed to contain prussic acid. They were once esteemed efficacious in the cure of cutaneous disorders, and are still employed in Italy in tinea capitis. *Viola ovata* is said to be a remedy for the bite of the rattlesnake.

GENERA.

L.—VIOLACEÆ.	<i>Reseda</i> , DC.	<i>Asperula</i> , V. Symp.	<i>Cuscuta</i> , DC.
	<i>Viola</i> , Linn.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Hyssopus</i> , DC.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Mentha</i> , Spach.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Chelidonium</i> , Rehm.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Helleborus</i> , Jacq.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Sedum</i> , Spach.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Poa</i> , DC.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Junonia</i> , Poir.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Pentstemon</i> , Vahl.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.
<i>Nicotiana</i> , Kunth.	<i>Asperula</i> , V. Symp.	<i>Asperula</i> , V. Symp.	<i>Viola</i> , Linn.

NUMBERS. GEN. II. S. 100

*Dioscorea*

POSTERON.—Passifloraceæ.—*Viola*, Linn. Franchet.

*Cuscuta*.

ADDITIONAL GENERA.

*Viola*, Linn.  
*Viola*, Linn.  
*Viola*, Linn.  
*Viola*, Linn.  
*Viola*, Linn.  
*Viola*, Linn.



## ORDER CXVII. FRANKENIACEÆ.—FRANKENIADS.

Frankeniaceæ, *Aug. de St. Hilaire, Mém. Plac. Centr.* 39. (1815); *DC. Prodr.* 1. 349; *Endl. Gen. excii.*; *Meisner, Gen.* 22.

DIAGNOSIS.—*Violæ Exogens*, with polypetalous flowers, a tubular furrowed calyx, and hypogynous unguiculate petals.

Herbaceous plants or under-shrubs. Stems very much branched. Leaves opposite, exstipulate, with a membranous sheathing base; often revolute at the edge. Flowers sessile in the divisions of the branches, and terminal, embosomed in leaves, usually pink. Sepals 4-5, united in a furrowed tube, persistent, equal. Petals alternate with the sepals, hypogynous, unguiculate, often with appendages at the base of the limb. Stamens hypogynous, either equal in number to the petals, and alternate with them, or having a tendency to double the number; anthers roundish, versatile, opening longitudinally. Ovary superior; style filiform, 2-3- or 4-fid; ovules 00, anatropal, attached to parietal placenta, and usually arising from long stalks. Capsule 1-celled, inclosed in the calyx, 2-3- or 4-valved, many-seeded. Seeds very minute; embryo straight, erect, in the midst of albumen (divided into two plates, *Gærtn. fil.*) with a very short inferior radicle.

Allied on the one hand to Cloveworts, from which they are distinguished by their different placentation, and by the form of their embryo; and on the other to Violetworts, which differ in having a loculicidal, not septicidal, dehiscence. Their great feature is the presence of a long furrowed calyx, within which the petals are inserted below the ovary, by means of long stalks. The petals, moreover, have generally a scaly appendage. Wormskioldia is a very anomalous plant. It seems more



Fig. CCXXXIII.

nearly allied to this than any other Order, and cannot possibly belong to Droseraceæ, in which it is placed by Achille Richard provisionally. It seems to indicate a relation between Frankeniads, on the one hand with Moringads, and on the other with Capparids. The nearest approach to the tubular calyx of Frankeniads is to be found in Crownworts (Malesherbiaceæ).

This Order is chiefly found in the north of Africa and south of Europe. Two species are natives of the Cape of Good Hope, one of South America, four of New Holland, and three of temperate Asia. None have been found in tropical India or North America.

Endlicher says that Frankeniads are mucilaginous and slightly aromatic. The leaves of *Beatsonia portulacifolia* are used in St. Helena as tea.

#### GENERA.

*Frankenia*, Linn.  
*Nothria*, Berg.  
*Franca*, Michel.

*Beatsonia*, Roeb.  
*Anisadenia*, Wall.

*Wormskioldia*, Thonn.  
*Tricliceras*, DC.

*Schumacheria*, Spr.  
*Streptopetalum*, Hocht.

NUMBERS. GEN. 4. Sp. 24.

#### *Caryophyllaceæ.*

POSITION.—*Violaceæ*.—FRANKENIACEÆ.—*Sauvagesiaceæ*.

Fig. CCXXXIII.—*Frankenia ericifolia*.—*Webb*. 1. a flower; 2. its stamens, &c.; 3. a perpendicular section of the ovary; 4 a section of a seed.

N.B. A. Richard refers *Wormskioldia* to *Turnerads*.







*indica*, *dioica*, *Furas*, and *orientalis* are highly astringent, and are used both in medicine and dyeing. *Myricaria germanica*, a common shrub in our gardens, has a balsamic astringent bitter bark, which was formerly official. *Myricaria herbacea* is used as tea among the Monghols, and its woody tissue is considered to be tonic.

GENERA.

*Tamarix*, *L.*

|

*Myricaria*, *Desv.*

|

*Trichaurus*, *Arn.*

NUMBERS. GEN. 3. Sp. 43.

*Lythraceæ* ?

POSITION.—*Crassulaceæ* ?.—TAMARICACEÆ.—*Frankeniaceæ*.

*Reaumuriaceæ*.

observes that the Persian manna known by the name of *Gen*, is formed by an insect in that way, and is not found on the upper branches or leaves, but only on the larger branches covered by those minute insects, and none is formed near wounds or cracks in the bark. This was particularly observed by Colonel Frederick in Persia, in a latitude not much south of Mount Sinai, and his account corresponds with that of a traveller who saw it in the same country both on a Tamarisk and on the small Oak of Kermanshaw. It is remarkable that the secretion should be unknown in Egypt and Arabia, where the *T. gallica* would seem to be common. Forskahl, who says it is the *Tarfa* of the Arabs, takes no notice of any manna being produced by it, and Mr. Malcolmson informs me that he could gain no intelligence of manna being produced by the Tamarisk in any of the south and west coasts of Arabia and Upper Egypt. He observed the trees frequently secreting salt, but not sugar. I must however add, that the plant which this gentleman found the Arabs calling *Tarfa*, was *T. orientalis*, not *T. gallica*, as appeared from the specimens he brought home. The bark of *T. gallica* is slightly bitter and astringent.—*Flora Medica*.



ORDER CNIX. SAUVAGESIACEÆ.—SAUVAGESIACEÆ.

Violacea, L. *Sauvagesia*, DC. *Prod.* 1. Pl. 1824.—*Sauvagesia*, *Reichb. bot. Exp. bot. Germ.* *Reichb. bot. Germ.* *Metz.* *Ges.* 2. 21.—*Sauvagesia*, *Frühmann*, *Botanica*, 20. 226. 1826.

**DIAGNOSIS.**—*Frühmann*, *Botanica*, 20. 226. 1826.—*Sauvagesia*, *Reichb. bot. Exp. bot. Germ.* *Reichb. bot. Germ.* *Metz.* *Ges.* 2. 21.—*Sauvagesia*, *Frühmann*, *Botanica*, 20. 226. 1826.

Shrub or annual herbs, with a terete, simple, or branched stem. Leaves alternate, stipule, sheathing, feathery-veined, nearly sessile, with fringed permanent stipules. Flowers perfect, regular, white, pink, violet or yellow, generally in terminal panicles or racemes, and on slender through-shaped stalks. Sepals 5, equal or unequal, imbricated. Petals 5, twisted in aestivation, deciduous. Stamens hypogynous, definite and opposite the petals, or 10, all fertile, in more rows than one, of which the innermost alone is fertile, the exterior assuming the appearance of petaloid scales. Anthers turned upwards, 2-celled, opening lengthwise. Ovary free, 1-celled, with 3 parietal placentae, sometimes 3-celled at the base and 1-celled at the apex; style terminal and stigma simple or none; so: ovules parietal, anatropal. Capsule 3-valved, 1-celled or 3-celled at the base, with the seeds attached to the edges of the valves. Seeds small, oblong, pitted, with a straight embryo in the axis of fleshy albumen, and the radicle near the hilum.

Among the other differences between these plants and *Violaceæ* may be mentioned their stamens, when definite in number, being opposite the petals, the anthers not having a membranous termination, the presence of 5 hypogynous scales representing sterile stamens, the fruit having a septicidal dehiscence, so that the seeds adhere to the edges and not the centre of the valves, and the strongly ribbed and imbricated calyx. The last character brings them near *Tubifera*, with which they accord in habit, but they differ in their stipules and decidedly parietal placentation. They are also said to approach *Sonchæa*; but this is by no means what

Endlicher points out their affinity with *Frankeniads*, from which, however, they are easily distinguished by their polysepalous calyx, stipules, and anthers turned upwards.

Almost nothing is known of their uses. *Sauvagesia* grows, the *Reichb. bot. Exp. bot. Germ.* *Reichb. bot. Germ.* *Metz.* *Ges.* 2. 21.—*Sauvagesia*, *Frühmann*, *Botanica*, 20. 226. 1826. is very mucilaginous. It has been used in Brazil for complaints of the bowels, and in the West Indies as a diuretic, or rather in cases of a slight inflammation of the bladder.



PL. CXXXV.

TYPE.

*Sauvagesia*, L.  
*Sauvagesia*, DC.  
*Reichb. bot. Exp. bot. Germ.*  
*Sauvagesia*, DC.  
*Reichb. bot. Exp. bot. Germ.*

*Sauvagesia*, L.  
*Sauvagesia*, DC.  
*Reichb. bot. Exp. bot. Germ.*

NUMBERS. GEN. 2. Sp. 16.

POSITION.—*Violacea*.—*Sauvagesia*.—*Frankeniaceæ*.  
*Reichb. bot. Exp. bot. Germ.*

PL. CXXXV.—LAVINIA VIOLACEA.—L. VIOLACEA. 1. A branch with flowers; 2. A seed; 3. A section of it.



## ORDER CXX. CRASSULACEÆ.—HOUSE-LEEKs.

*Sempervivæ*, Juss. Gen. 207. (1789).—*Succulentæ*, Vent. Tabl. 3. 271. (1799).—*Crassulæ*, Juss. Dict. des Sc. Nat. 11. 369. (1818).—*Crassulaceæ*, DC. Bull. Philom. n. 49. p. 1. (1801); *Fl. Fr. ed. 3. v. 4. p. 271.* (1805); *Mémoire* (1828); *Prodr.* 3. 381. (1828); *Endl. Gen. clix.*; *Meisn. p. 134.*—*Sedæ*, Spreng.

**DIAGNOSIS.**—*Violæ Exogens*, with polypetalous or monopetalous flowers, a many-leaved calyx, hypogynous petals, and follicular apocarpous fruit.

Succulent herbs or shrubs. Leaves entire or pinnatifid; stipules none. Flowers usually in cymes, sessile, often arranged on one side only, along the divisions of the

cymes. Sepals from 3 to 20, more or less united at the base. Petals inserted in the bottom of the calyx, either distinct or cohering in a monopetalous corolla. Stamens inserted with the petals, either equal to them in number and alternate with them, or twice as many, those opposite the petals being shortest, and arriving at perfection after the others; filaments distinct, subulate; anthers of 2 cells, bursting lengthwise. Hypogynous scales several, 1 at the base of each carpel, sometimes obsolete. Carpels of the same number as the petals, opposite to which they are placed around an imaginary axis, 1-

celled, tapering into stigmas, sometimes consolidated; styles continuous with the ovaries; ovules sutural, 00, or definite in number, horizontal or pendulous, anatropal. Fruit consisting of several follicles, opening by the suture, or collected into a capsule of several cells opening at the back. Seeds attached to the margins of the suture, variable in number; embryo straight, in the axis of fleshy albumen, with the radicle pointing to the hilum.

All these plants are remarkable for the succulent nature of their stems and leaves, in which they resemble many other and very different Orders. De Candolle suggests that their real affinity is with Saxifrages through Penthorum, and with Knotworts (Illecebraceæ) through Tilkea. In both those Orders the hypogynous scales of Houseleeks are wanting.



Fig. CCXXXVI.



1 Fig. CCXXXVII. 2



Are not these bodies analogous to the scales out of which the stems of *Hamamelis* spring? If so, an unsuspected affinity exists between them. Others, however, think that if we were to resolve the fruit of a *Sarcocolla*, or any other of the *Umbelliferae*, into its component parts, the result would be what we find in *Sedum* and *Euphorbia*. Bastlicher enters into a similar opinion, considering the *Hamamelis* venosity akin to *Trissacoids*. De Candolle observes (*Mémoire*, p. 3) that there is no instance of a similar flower in the Order, although it might have been expected from their analogy in some cases with *Cruciferae*. *Sempervivum tectorum* exhibits almost exactly the similar phenomenon of anthers bearing scales instead of pollen. Although Broussier has remarked that in certain *Hous* seeds no medullary rays are to be found. He describes the woody cylinder of *Sempervivum* as consisting of both parents of anthers and spiral vessels immediately around the pith, on the outside of which are placed leaflike scurfiness with very fine 4-sided dots, arranged in radiating rows, and interrupted with some periods of annular and reticulated vessels. These fibres are all in position, are entirely destitute of medullary processes, and are only interrupted in order to leave a passage for the vascular lamellæ belonging to the leaves, and for the cellular tissue that accompanies them. M. Broussier states, however, that this structure is not of common occurrence in the Order of *Hamamelis*. On the contrary, he describes the *Umbelliferae* parakoloma in the following words: "In this plant it may be said, notwithstanding the large size at which it arrives in a few years, that there is no woody tissue at all; in it, that very hard tissue, which is found in regular concentric rings in other *Hamamelis*, and which consists of dotted woody fibre and vessels, is entirely wanting; the stem in fact contains nothing more than bundles of the medullary sheath, composed entirely of spiral vessels, false tracheæ, with annular and reticulated vessels; but these bundles increase and multiply, so that they may be from 40 to 50 in an old stem, while there are not more than 20 or 24 in a young branch. They then are 2 or 3 millimetres thick, in the direction of the rays, instead of half a millimetre. Finally, the cellular space which they surround, or the pith, itself augments from 4 or 5 millimetres to 3 or 4 centimetres. So that every part continues to grow, whether cellular or vascular; but the bundles of the medullary sheath, thus increased in number and size, still remain entirely composed of annular vessels or false spirals, without intermixture of woody fibre, and are separated by hard medullary processes. Thus we have in this Order an example of essential differences in the anatomical structure of the trunk." (*Essai*, p. 8, volume 4, p. 11, p. 1, 437). Schleiden found in an old stem of an *Eleocharis* an entire uniform mass of wood, formed of parenchyma without vessels, and scattered therein were vertical cords of very thin-sided parenchyma, in the midst of which ran spiral vessels, none of which might still be unrolled (*Wissenschaft*, 1855); and he suspects that it may belong to the whole of this Natural Order. I do not, however, find it in *Eleocharis* family, whose succulent stem has a very large pith, and a ring of extremely important vessels, among which spiral vessels are distributed with great irregularity.

It appears, from De Candolle's researches, that of the 172 specimens which he supposed the Order to consist, 122 are found at the Cape of Good Hope, 2 in South America beyond the tropics, 2 in the same country within the tropics, none in the West Indies or the Mauritan Islands, 3 in Mexico, 7 in the United States, 12 in Siberia, 14 in the Levant, 52 in Europe, 13 in the Canaries, 2 in Southern Africa beyond the limits of the Cape, 9 in Barbary, 5 in the East Indies, 4 in China and Japan, and 2 in New Holland. To these are to be added several species from the Malayas. They are found in the driest situations, where not a blade of grass nor a particle of moss can grow, on scabrous rocks, old walls, sandy hot plains, alternately exposed to the harshest light of night and the fiercest rays of the noon-day sun. Soil is to them a something to keep them stationary, rather than a source of nutriment, which in these plants is conveyed by means of mouths, invisible to the naked eye, but covering all their surface, to the juicy beds of cellular tissue which lie beneath them.

Refrigerant and astringent properties, mixed sometimes with a weak deal of acridity, distinguish them. The fishermen of Madeira rub their eyes with the fresh juice of the *Limon* or *Sempervivum glutinosum*, by which the eyes are rendered so dimble as to be turned, provided they are steeped in some alkaline spirit. Malabar is said to be *Sempervivum tectorum* combined with lime. Kalmian (*Prostratus*) appears to want, on exception to the general acrial and stimulating properties of the Order. *Sedum arbutifolium* is it as a refrigerant; and this is the common quality of the Order. *Sedum rubicundum*, the argemone to women of Dioscorides, and *Sempervivum tectorum*, are thought to be astringent. *Sedum Telephium* is another, and also astringent. Its juice is said to be used by country people in diarrhoea. Its acridity on the other hand gives the juice of *Sedum acre*, a rubefacient emetic and purgative. *Bryophyllum calycinum*, is considered to be a



nerary. The herbage of *Crassula tetragona*, boiled in milk, is used at the Cape of Good Hope against dysentery ; that of *Rhodiola rosea* is an esculent among the Greenlanders.

# GENERA.

I. CRASSULÆÆ.	Globulea, Haw.	Crassouvia, Comm.	Procrassula, Gris.
Tillæa, Mich.	Thisantha, Eckl. et Zeyh.	Physocalycium, Vest.	Aithales, Webb et Berth.
Bulliarda, DC.	Grammanthes, DC.	Cotyledon, DC.	Sempervivum, Linn.
Helophytum, Eck. et Z.	Vauanthes, Haw.	Pistorinia, DC.	Jovibarba, DC.
Dasytemon, DC.	Cyrtogyne, Haw.	Umbilicus, DC.	Monanthes, DC.
Telmisssa, Fenzl.	Rochea, DC.	Orostachys, Fisch.	Chronobium, DC.
Septas, Linn.	Danielia, DC.	Cotyle, DC.	Aichryson, Webb et B.
Crassula, Haw.	Larochea, Haw.	Cotylephyllum, Link.	Æonium, Webb et Bth.
Gomara, Adans.	Franciscaria, DC.	Mucizonia, DC.	Greenovia, Webb et B.
Sarcotipes, Eck. et Zh.	Franciscæa, DC.	Rosularia, DC.	Petrophyte, Webb et B.
Petrogeton, Eck. et Zh.	Kalosanthus, Haw.	Echeveria, DC.	
Tetraphyle, Eck. et Zh.	Dietrichia, Tratt.	Pachyphytum, Kl.	II. DIAMORPHEÆ.
Pyrgosea, Sweet.	Kalanchoë, Adans.	Sedum, Linn.	Diamorpha, Nutt.
Turgosea, Haw.	Verea, Willd.	Rhodiola, Linn.	Penthorum, Linn.
	Bryophyllum, Salisb.	Anacamperos, Tourn.	

NUMBERS. GEN. 22. Sp. 450.

*Caryophyllaceæ.*

POSITION.—*Sauvagesiaceæ.*—*CRASSULACEÆ.*—*Turneraceæ.*

*Saxifragaceæ.*



Fig. CCXXXVIII.

Fig. CCXXXVIII.—*Greenovia* (*Sempervivum aureum*.)—*Webb*. 1. petals and stamens ; 2. flower seen from one side ; 3. ripe fruit ; 4. seed ; 5. its embryo.

# ADDITIONAL GENERA.

*Combesia*, A. Richard, } near *Tillæa*.  
*Disporocarpa*, C. A. M. }

*Fouquiera*, H. B. K. } according to A. Gray.  
*Bronnia*, H. B. K. }  
*Sphaeritis*, Eckl. & Zeyh. }

In Ireland the leaves of *Sedum dasphyllum* rubbed among oats are regarded as a certain cure for worms in horses.



Order CXXI. TURNERACEÆ. TURBIDACEÆ.

Loasac, 3 of Turneraceæ. *Namby*. N. G. et S. C. 116. (1841). 4. *Turneraceæ*. DC. *Prodr.* = 348. 2. *Loasac*. Guss. *exalt.* = *Melastom.* 2. 1. 2.

DIAGNOSIS. — *Violoid*. *Hermap.* with *polygynous* flowers, *gynæcium* consisting of *ovary*, *ovules* and *multilocular* *ovary*.

Herbaceous plants, having sometimes a tendency to become shrubby, with a simple or occasionally stellate pubescence. Leaves alternate, without stipules, except supporting with 2 glands on the petiole. Flowers axillary, their pedicels either distinct or adnate with the petiole; with 2 bractelets. Petals yellowish, nearly blue. Calyx inferior, often coloured, with 5 equal lobes, imbricated in aestivation, lined by a very thin plate. Petals 5, inserted into the tube of the calyx, equal, with a twisted aestivation. Stamens 5, inserted into the tube of the calyx below the petals, from which they are alternate; filaments distinct; anthers *oblong*, erect, 2-celled. Ovary superior, 1-celled, with 3 parietal placentæ; ovules 30, anatropal, styles 3, coherent above or long and simple, split, branched or marked at the apex. Capsule 2-valved, 1-celled, opening from the point about as far as the middle, the valves bearing the placenta in their median line. Seeds with a thin membranous strophiole or endosperm, sometimes reticulated; embryo slightly curved, in the middle of fleshy albumen; radicle turned towards the hilum; cotyledons somewhat plano-convex, acquiring the texture of leaves when germinating.

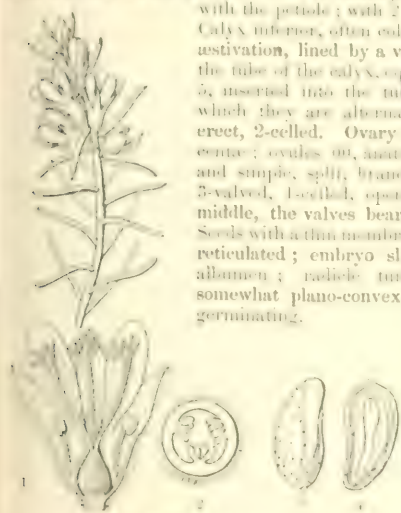


FIG. CXXXIX.

The little herbaceous plants forming this Order were oddly placed by DeCandolle between Loasacæ and the Fouquieriaceæ, the former a group of plants with an inferior ovary, and the latter an imaginary Order, out of whose two genera some in fact exist. Others station it in the affinity of Rock-Roses, from which it differs in the calyx, in the insertion of the stamens, and in the aestivation.

of the radicle to the hilum, agreeing with them in habit. With Mallowæ the Order corresponds in the twisted aestivation of the corolla, and in habit. But with *Loasacæ* and *Loasacæ* there is most in common: the presence of glands upon the veins of the petioles of Turneracæ is a confirmation of their affinity to the former. They are distinguished from Loasacæ by their fruit being superior, and by their definite number: the former character is, however, weakened by the nearly superior fruit of some Loasacæ. The hypogynous petals of Frankeniads sufficiently distinguish that Order, as do nothing of their unguiculate petals. The forked styles of Turneracæ are very peculiar.

Natives exclusively of the West Indies and South America. Their name is good reason for supposing *Turnera* *trioniflora* to be a native of Japan, as has been asserted.

The herbage of some of them is rather aromatic. *Turnera* *speciosa* is aromatic, and is employed in Brazil against dyspepsia. *Martius*. *Turnera* *littoralis* is considered a tonic and expectorant.

GENERA.

*Turnera*, *P.*  
*Turnera*, *P.*  
*Turnera*, *Presl*

*Turnera*, *Presl*  
*Turnera*, *Presl*  
*Turnera*, *Presl*

NUMBERS. GEN. 2. SP. 00. — *Turnera* 2. 1. 2.

POSITION — Frankeniaceæ — Turneraceæ — Mallowaceæ — *Turnera*.

FIG. CXXXIX. — *Turnera* *trioniflora*. 1. A flower, 2. A section of ovary, 3. A seed, 4. A section of it.



## ALLIANCE XXVII. CISTALES.—THE CISTAL ALLIANCE.

DIAGNOSIS.—*Hypogynous Enogens, with monodichlamydeous flowers, parietal or sutural placentæ, and a curved or spiral embryo, with little or no albumen.*

If we consider the Violal Alliance to be closed by Turnerads, that of Cistals will necessarily commence with Rock Roses, which have much the habit of the former, but which are distinctly separated by their convolute embryo and orthotropal seeds, to say nothing of divers other characters. If the Rock Roses are regarded as an Order with indefinite stamens, they will join Capparids, but if the genera with definite stamens are assumed to be the point of departure onwards, then it is into Crucifers that the line will pass. The parietal placentation of Rock Roses is universal; and though the number of placentæ is never reduced to two, yet if Fig. CCXII., 2, in the following page has one of its placentæ removed and the other two brought into contact, we shall have the silicle of a Crucifer. There is no distinct passage from Crucifers into Resedads, which may be regarded as an anomalous form of Capparids rather than in direct succession from Crucifers; but to Capparids themselves Crucifers pass by the whole division of Cleomeæ among the former, some of which are actually hexandrous. The stipitate fruit of Capparids brings us easily to Sterculiads in the next Alliance.

Supposing these views to be just, then the mutual relation of the Orders included in the Cistal Alliance may be thus expressed:

*Turneraceæ*.—*Cistaceæ*: *Brassicaceæ*: *Capparidaceæ*.—*Sterculiaceæ*.  
*Resedaceæ*.

## NATURAL ORDERS OF CISTALS.

<i>Stamens not tetradynamous, generally indefinite. Flowers <math>\frac{3}{\sqrt{}}</math> or <math>\frac{2}{\sqrt{}}</math>. Seeds with albumen. Fruit closed up</i>	122. CISTACEÆ.
<i>Stamens tetradynamous. Flowers <math>\frac{4}{\sqrt{}}</math></i>	123. BRASSICACEÆ.
<i>Stamens not tetradynamous, definite. Flowers not tetramerous. Seeds without albumen. Fruit usually open at the point</i>	124. RESEDACEÆ.
<i>Stamens not tetradynamous. Flowers <math>\frac{4}{\sqrt{}}</math>. Seeds without albumen. Fruit closed up</i>	125. CAPPARIDACEÆ.



ORD. CXXII. CISTACEÆ.—Ruy-Houze.

Engl. Bot. Gart. Berl. (1789).—Cristaceæ, Pers. Syn. 2. 216. (1796).—Cristaceæ, DC. Prodr. 1. 371. (1824).—Cristaceæ, DC. Prodr. 1. 371. (1824).—Cristaceæ, DC. Prodr. 1. 371. (1824).

DIAGNOSIS.—*Chiefly European, with numerous Asiatic and American species, flowers mostly red and most unisexual, almost all with inferior ovary.*

Stems or herbaceous plants. Branches often woody. Leaves entire, opposite or alternate, stipulate or exstipulate, usually entire round, but sometimes lanceolate. Racemes usually unilateral. Flowers white, yellow, or red, very fragrant. Sepals 5, continuous with the pedicel, persistent, unequal, the three lower with a rounded anterior tip. Petals 5, very rarely 3, hypogynous, fugitive, often crumpled in aestivation, and twisted in a direction contrary to that of the sepals. Stamens definite or indefinite, hypogynous, distinct; anthers 2-celled, opening lengthwise. Ovary free, 1- or many-celled; ovules orthotropal, (very rarely anatropal, Spreng.); style single; stigma simple. Fruit capsular, usually 3- or 5-valved, occasionally 10-valved, either 1-celled with parietal placentae in the axis of the valves, or imperfectly 5- or 10-celled with dissepiments proceeding from the middle of the valves, and touching each other in the centre. Seeds definite or ∞. Embryo inverted, either spiral or curved, in the midst of mealy, or somewhat horny albumen. Radicle remote from the hilum.

These plants are perfectly distinguished from Violaceæ, with which they were formerly confounded, by their angular and inverted ovules; from Bixaceæ by this last character, by their mealy albumen, habit, and not having the leaves cordate; from Tursaceæ, by the latter character, and the structure of the fruit: they are also akin to Poppyworts by the genus *Dicentra*. None of their affinities, or of others that may have been mentioned by other Botanists, appear, however, so strong as with *Urticaceæ* and *Capparidæ*, to which their curved embryo and parietal placentae bring the fruit. These very near. From all the Crist. Alliance they are, however, removed by the position of albumen in some *Abrutaceæ*.

A remarkable plant, found in Asia, Africa, and South America, and named *Croton peruvianum*, seems to offer the most highly developed form of this Order, though it differs in very little except its habit. Botanists usually admit it to be an *Urticaceæ* on its parietal placentae, anisomerous flowers, and curved embryo lying by the side of albumen, seem fatal objections to that assumption. In fact it has the *Urticaceæ* habit.



FIG. CXXI.

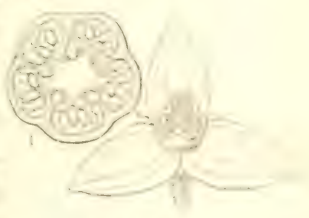


FIG. CXXII.

FIG. CXXI.—*Cistus incanus*. 1. A flowering branch, showing the leaves and flowers; 2. A single flower, showing the petals and the ovary.

FIG. CXXII.—1. A section of the fruit of *Cistus incanus*. 2. A single flower, showing the petals and the ovary.



Theads except in its indefinite stamens. An anonymous writer in the *Linnæa*, whose views are often judicious, would place the Rock Roses in the neighbourhood of Mesembryaceæ, Nyctaginaceæ, and Polygonaceæ, and next Portulacaceæ: an opinion evidently formed upon the supposed importance of a curved embryo and mealy albumen.

South Europe and the north of Africa are the countries that Rock Roses chiefly inhabit. They are rare in North America, extremely uncommon in South America, and scarcely known in Asia.

The species have no marked properties, except that the resinous balsamic substance, called Ladanum, is obtained from *Cistus creticus*, and others; it has been much esteemed as a stimulant and emmenagogue; it has also been recommended in chronic catarrh. *Helianthemum vulgare* had once some reputation as a vulnerary, but it is now forgotten. The trunk of *Cochlospermum Gossypium* yields the gum Kuteera, which in the north-western provinces of India is substituted for Tragacanth.—*Royle*. A decoction of the roots of *Cochlospermum insignis*, called in Brazil Butua do curvo, is employed in internal pains, especially such as are produced by falls or accidents; it is also asserted to heal abscesses already commenced. *C. tinctorium* is used in cases of amenorrhœa, and also as a yellow dye.

#### GENERA.

<i>Fumana</i> , Spach.	<i>Stephanocarpus</i> , Spch.	<i>Argyrolepia</i> , Spach.	<i>Lechea</i> , Linn.
<i>Cistus</i> , Tournef.	<i>Helianthemum</i> , Tournef.	<i>Tuberaria</i> , Dun.	<i>Lechidium</i> , Spach.
<i>Halimium</i> , Dunal.	<i>Brachypetalum</i> , Dun.	<i>Lecheoides</i> , Dun.	<i>Hudsonia</i> , Linn.
<i>Ladanum</i> , Spach.	<i>Aphananthemum</i> , Sph.	<i>Crocantemum</i> , Spach.	<i>Tæniostoma</i> , Spach.
<i>Rhodocistus</i> , Spach.	<i>Eriocarpum</i> , Dun.	<i>Heteromeris</i> , Spach.	<i>Cochlospermum</i> , Kunth.
<i>Erythrocistus</i> , Dunal.	<i>Pseudocistus</i> , Dun.	<i>Trichasterophyllum</i> , Willd.	<i>Wittelsbachia</i> , Mart.
<i>Ledonia</i> , Spach.	<i>Rhodax</i> , Spach.		<i>Maximiliana</i> , Schk.

NUMBERS. GEN. 7. Sp. 185.

#### *Sterculiaceæ.*

POSITION.—*Brassicaceæ*.—CISTACEÆ.—*Capparidaceæ*.

#### *Hypericaceæ.*

M. Planchon separates *Cochlospermum* as the type of an order which he calls COCHLOSPERMEÆ, and which he conceives to be more allied to Zygophyls and Cranesbills; and he refers to the order the genus *Amoreuxia*, or *Euryanthe*. (See *London Journal of Botany*, VI. 301). I am not, however, prepared to remove these plants from the neighbourhood of Cistaceæ, where they now stand. The following is the little group which M. Planchon proposes.

#### COCHLOSPERMEÆ.

*Cochlospermum*, Kunth, as above.

*Azaredia*, Allemão.

*Amoreuxia*, Moc. & Sesse.

*Euryanthe*, Schlecht.



## ORDER CXXIII. BRASSICACEÆ.—CRUCIFERÆ.

Cruciferae, *Juss. Gen.* 277. 1789. (*DC.* *Monocotyled. et Dicotyled.* 2. 1825. *Flora* 2. 1828. *Prod. Rom.* 1829. (*Engelm. Gen. Symb.* 1. *Myrtaceae* 1. 1830.)

DIAGNOSIS.—*Cotyled. Fumicæ*, with tetradynamous stamens and cruciform corolla.

Herbaceous plants, annual, biennial, or perennial, very seldom suffrutescent. Leaves alternate. Flowers usually yellow or white, seldom purple, without bracts, sometimes in racemes. Sepals 4, deciduous, imbricate or valvate. Petals 4, cruciate, alternate with the sepals. Stamens 6, of which two are shorter, solitary, and opposite the lateral sepals; occasionally toothed; and four longer, in pairs, opposite the anterior and posterior sepals, generally distinct, sometimes connate, or furnished with a tooth in the inside. Disk with various green glands between the petals and the stamens and ovary. Ovary superior, unilocular, with parietal placenta usually meeting in the middle, and forming a spurious dissepiment. Stigmas 2, opposite the placenta. Fruit a silique or siliqua, 1-celled, or spuriously 2-celled; 1 or many-seeded; dehiscing by two valves separating from the replum; or indehiscent. Seeds attached in a single row by a funiculus to each side of the placenta, generally pendulous. Albumen none. Embryo with the radicle folded upon the cotyledons, which are occasionally slit or lobed.

This Order is among the most natural that are known, and its character of having what Linnaean Botanists call tetradynamous stamens is scarcely subject to exception. It has a near relation to Capparidæ, with which it agrees in the number of the stamens of some species of that Order, in the fruit having two placenta and a similar mode of dehiscence, and in the quaternary number of the divisions of the flower. To Poppyworts it is thought to approach in the unusual number of the petals and in the structure

of the fruit of some genera of that Order, such as *Glauconia* and *Oxalidaceum*. With the silique-fruited Fumeworts it has also some analogy, and even with the whole of that Order in the number of its petals, supposing the exterior portion of the corolla of the floral envelopes of Fumeworts to be common, or in the binary division of the leaves, from which the quaternary is only a slight deviation, upon the hypothesis I have suggested in speaking of that Order. But the totally different structure of the seed, which Crucifers to be associated in the same group with the latter.

Crucifers may be said to be characterised by their deviation from the ordinary symmetry observable in the relative arrangement of the primary fructification of such plants, deviations which are of a very interesting nature. These deviations are grouped thus: two stand opposite each of the anterior and posterior sepals, and one opposite each of the lateral sepals; there being 6 stamens in 4 sepals, instead of 10 stamens as would be normal. Now in what way does this arise? Is the whole of the corolla truly considered double, one of the series belonging to the sepals, and one to the petals, and of these, a part imperfect? I am not aware of such mode of explanation having been offered, nor do I know of a better one. It appears to me, that the most satisfactory explanation, by the constant abortion of the stamens usually belonging to the anterior and



Fig. CXXIII.

Fig. CXXIII.—Brassicaceae. 1. a stamen; 2. longitudinal section of the silique, showing the two valves separating from the replum; 3. a transverse section of a silique, showing the two locules.



posterior sepals, the two pairs that remain belonging in fact to the four petals. But it is in their fruit that the great peculiarity consists.

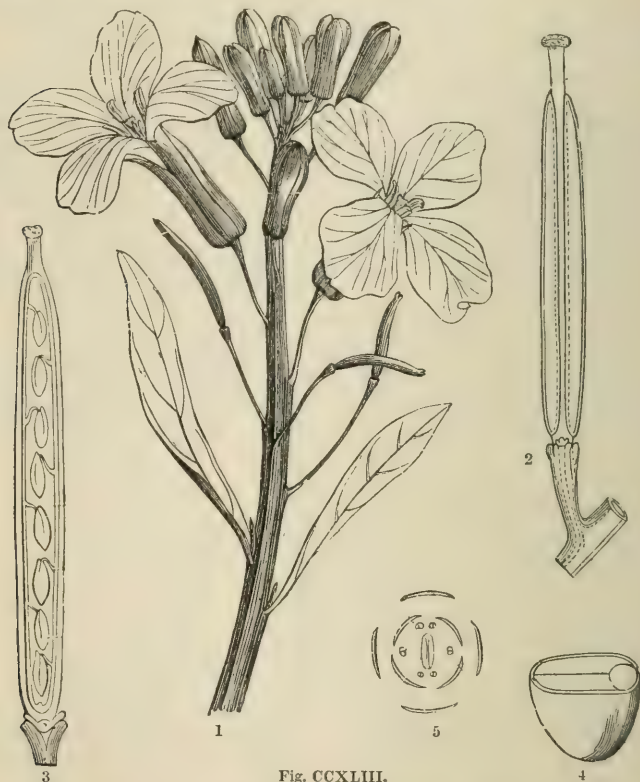


Fig. CCXLIII.

Since the placentæ are opposite the lobes of the stigma in this Order, it is difficult to reconcile the fruit with any general theory of structure. Either it is in reality composed of four carpels, two of which are abortive, as was first suggested by me in the *Botanical Register*, fol. 1168, or each of the two lobes of the stigma is composed of two half lobes belonging to different carpels, as in Poppyworts. In any view, the dissepiment which cuts off the interior of the fruit into two cells must be considered spurious, and a mere expansion of the placentæ.

The opinions of Botanists are much divided as to this matter; M. Kunth agrees with me in considering the fruit composed of four carpels. And a variety of evidence has gradually collected in favour of this theory. M. Alph. De Candolle has shown that the common Wall-flower is occasionally 4-celled (*Monstruosité Végétale*, 15. t. 5.) There is a genus called *Tetracellion*, which derives its name from the same circumstance. Mr. Barker Webb has published an account of a Canary shrub, named *Parolinia*, in which the valves are constantly extended into stigmas. But Mr. Howell (*Ann. N. Hist.* x. 254.) adopts Brown's view of the subject, and, because of the supposed affinity of Poppyworts, concludes that the fruit of Crucifers is only composed of two carpels. He does not, however, offer any direct proof of the correctness of this opinion.

Almost all Crucifers are destitute of bracts, and have the



Fig. CCXLIV.

Fig. CCXLIII.—1. *Cheiranthus cheiri*; 2. its stigma; 3. the same with one valve off; 4. a cross section of a seed; 5. a diagram to illustrate the position of the parts of the flower.

Fig. CCXLIV.—Fruits of *Parolinia ornata*, after Webb.



calyx imbricated or gestivation; and Brown has noticed (*Zoönomia*, p. 73) that in *Br. virginica* and *Rosa* it is valvate.

Lamæ are divided into the Order, which is the same as the *Tetradynamæ* by the same, in the fruit, under two heads, bearing the names of *Siliquæ* and *Sinapisæ*. These recently divisions have been founded upon the nature of the plume of the corolla and the position of the radicle with respect to them. It is difficult to say what degree of importance really deserves to be attached to these characters, which are however as present in general use.—See *Therap. in Arb. Læp. N.*, York, 1810.

This is an Order eminently European; 106 species are found in northern and middle Europe, and 176 on the northern shores or islands of the Mediterranean; 43 are peculiar to the coast of Africa, between Morocco and Abyssinia; 134 in Syria, Asia Minor, Tauria, and Persia; 99 to Siberia; 35 to China, Japan, or India; 16 to New Holland and the South Sea Islands; 5 to the Isle of France and the neighbouring Islands; 70 to the Cape of Good Hope; 9 to the Canaries or Madeira; 3 to St. Helena; 2 to the West Indies; 41 to South America; 15 to North America; 4 to the limits between North America and Kamtchatka; and 35 are common to various parts of the world. This being their general geographical distribution, it appears that, contrary of species that are uncertain, or common to several different countries, about 300 are found in the southern hemisphere, and about 600 in the northern, or 91 in the Near, and the rest in the Old World. Finally, if we consider them with regard to temperature, we shall find that there are,—

In the frigid zone of the northern hemisphere	305
In all the tropics (and chiefly in mountainous regions)	20
In the temperate zone	544
of the northern hemisphere	548
of the southern ditto	30
	578

Such were the calculations of De Candolle in 1821. Although requiring considerable modification, especially in the Asiatic and North American numbers, which are much too low, they serve to give a general idea of the manner in which this Order is dispersed over the globe.

The universal character of Crucifers is to possess antiscorbutic and stimulant qualities, combined with an acrid flavour. The essential species are among the commonest of all plants, and only require to be named. They are found to contain a great deal of nitrogen, to which it is supposed is due their animal odour when rotting. Mustard, Cress, Horseradish, and many others, are extremely stimulating and acrid. The seeds of *Sinapis chinensis* are considered by Hindoo and Mahometan practitioners as stimulant, stomachic, and laxative. The seeds of one species of *Arabis ciliolata*, *Rutæ*, are prescribed by the Indian doctors as stomachic and gently stimulant; but they apprehend its bringing on abortion if imprudently given. When the seed-thrust is dispersed among an abundance of turnage, various parts of these plants become a wholesome food; such as the root of the Rانش and the Turnip, the leaves of the Water-cress, the Cabbage, and the Sea-kale. According to Muller the Water-cress contains iodine Sulphur exists in the oils of Mustard and Horseradish to the extent of about 30 per cent.—*Chém.*, 1813, p. 674. The oil of the seeds is one of their more important products. That from Rape is in very general use, and the residue, rich in nitrogen, is largely employed by the farmer as manure, or cattle feed, under the name of Oil-cake. Another of the oil plants is *Camelina sativa*, or Gold of Pleasure; but its cake is said to be dangerous for feeding. *Chém.*, 1813, p. 673; brooms are made from the dry twigs. *Cruciferae affinis*, or Scurvy-grass was once in great repute as an antiscorbutic. It is stimulant and diuretic if eaten fresh, but becomes inert when dried. *Cruciferae præcozes* is said to



PL. CRUCIF.



be stimulant, diaphoretic and diuretic. The dried flowers have been a popular remedy for epilepsy in children. The great fleshy root of *Crambe tatarica*, sometimes called Tartar bread, is eaten in Hungary, peeled and sliced with oil, vinegar, and salt, or even when boiled. *Isatis tinctoria*, or Woad, was formerly a favourite blue dye in this country. Numerous species are celebrated for their beauty, of which the Wall-flower, Stock, Honesty, and Rocket, are every-day examples. Finally, one of the Order possesses strongly-marked hygrometrical qualities. This plant, the *Anastatica hierochuntina* or Rose of Jericho, is an annual, found wild in the Egyptian deserts, and when full grown contracting its rigid branches into a ball, which is soon caught up by the wind and hurried from place to place. But as soon as it is exposed to water the branches relax and spread flat, as if its life was renewed. Some superstitious tales are told of it, among which it is said to have first bloomed on Christmas eve, to salute the birth of the Redeemer, and paid homage to His resurrection by remaining expanded till Easter.—See *Gardeners' Chronicle*, 1842, p. 363.

# GENERA.

## I. PLEURORHIZÆ

(0 = 1)

### ARABID.Æ.

*Matthiola*, R. Br.  
*Leucojum*, Mönch.  
*Pachynotum*, DC.  
*Luparia*, DC.  
*Pinaria*, DC.  
*Acinotum*, DC.  
*Triceras*, Andrzejows.  
*Notoceras*, R. Br.  
*Diceratium*, Ait.  
*Parolinia*, Webb.  
*Andrzejowskyia*, Reichenb.  
*Macroceratium*, DC.  
*Cheiranthus*, R. Br.  
*Schelhammeria*, Herit.  
*Cheiri*, Adans.  
*Pistostylis*, Andr.  
*Dichroanthus*, Webb et Ber.  
*Jodanthus*, Torr. et A. Gr.  
*Clausia*, Troitzk.  
*Oudneya*, R. Br.  
*Nasturtium*, R. Br.  
*Cardaminum*, Mönch.  
*Sisymbrium*, Magnol.  
*Bæumerta*, Fl. Wetter.  
*Brachylobos*, Allion.  
*Radicala*, Dill.  
*Roripa*, Scop.  
*Caroli-Gmelina*, Fl. Wetter.  
*Clandestina*, DC.  
*Barbarea*, R. Br.  
*Streptanthus*, Nutt.  
*Eucalis*, Nutt.  
*Turritis*, Dill.  
*Pachyneurum*, Bung.  
*Arabis*, Linn.  
*Abazicarpus*, Andr.  
*Campylocarpus*, C. A. M.  
*Turritella*, C. A. M.  
*Cardaminopsis*, C. A. M.  
*Leptostylis*, C. A. M.  
*Catalobus*, C. A. M.  
*Stevenia*, Fisch. et Adam.  
*Parrya*, R. Br.  
*Neuroloba*, Andr.  
*Leisopora*, C. A. M.  
*Ermannia*, Cham.  
*Phœnicaulis*, Nutt.  
*Macropodium*, R. Br.  
*Cardamine*, Linn.  
*Pteroneuron*, DC.  
*Dentaria*, Tournef.  
*Leavenworthia*, Torr.  
*ALASSID.Æ.*  
*Unaria*, Linn.  
*Brachypus*, Led.  
*Ricotia*, Linn.  
*Scopolia*, Adans.  
*Farselia*, Torr.  
*Alyssum*, Adans.

*Cyclocarpæa*, DC.  
*Fibigia*, Medik.  
*Meniocus*, Desv.  
*Berteroa*, DC.  
*Alysson*, Medik.  
*Mönchia*, Roth.  
*Stevens*, Andr.  
*Aubrietia*, Andr.  
*Vesicaria*, Lam.  
*Alyssoides*, Medik.  
*Physaria*, Nutt.  
*Coluteocarpus*, Boiss.  
*Glyce*, Lindl.  
*Koniga*, Adans.  
*Clypeola*, Neck.  
*Ocladenia*, R. Br.  
*Lobularia*, DC.  
*Schiwerekia*, Andr.  
*Aurinia*, Desv.  
*Pislonema*, C. A. M.  
*Alyssum*, Linn.  
*Adyseton*, Scop.  
*Odontarrhena*, C. A. M.  
*Ptilotrichum*, C. A. M.  
*Clypeola*, Linn.  
*Fossilinia*, Scop.  
*Jonthlaspi*, Tournef.  
*Orium*, Desv.  
*Bergetitia*, Desv.  
*Peltaria*, Linn.  
*Bohatschia*, Crantz.  
*Petrocallis*, R. Br.  
*Zizia*, Roth.  
*Draba*, Linn.  
*Odontocyclus*, Turcz.  
*Erophila*, DC.  
*Gansblum*, Adans.  
*Cochlearia*, Linn.  
*Rhizobotrya*, Tausch.  
*Kernera*, Medik.  
*Armoracia*, Rupp.  
*Raphanis*, Mönch.  
*Grællsia*, Boiss.  
*TETRAPOMID.Æ.*  
*Holargidium*, Turcz.  
*Tetrapoma*, Turczan.  
*Tetracellion*, Turczan.  
*SELENID.Æ.*  
*Selenia*, Nutt.  
*THLASPID.Æ.*  
*Didymophysa*, Boiss.  
*Thlaspi*, Dillen.  
*Pyrophragma*, DC.  
*Pterolobium*, Andr.  
*Carpoceras*, Link.  
*Nomisma*, DC.  
*Neurotropis*, DC.  
*Pterotropis*, DC.  
*Lyrocarpa*, Harv.  
*Brossardia*, Boiss.  
*Teesdalia*, R. Br.  
*Guepinia*, Bart.  
*Iberis*, Linn.  
*Arabis*, Adans.

*Pseudo-Thlaspi*, Magn.  
*Thlaspidium*, Andr.  
*Cynocardium*, Webb et Berth.  
*Heldreichia*, Boiss.  
*Zygopeltis*, Fenzl.  
*Biscutella*, Linn.  
*Jondraba*, Medik.  
*Thlaspidium*, Medik.  
*Dithyrea*, Harv.  
*Diastrophis*, Fisch. et Mey.  
*Megacarpæa*, DC.  
*Crenularia*, Boiss.  
*Moriera*, Boiss.  
*CREMOLOBID.Æ.*  
*Cremolobus*, DC.  
*Menonvillea*, DC.  
*ANASTATICID.Æ.*  
*Morettia*, DC.  
*Nectouxia*, DC.  
*Anastatica*, Gärtn.  
*Hierocotis*, Adans.  
*EUCOLID.Æ.*  
*Euclidium*, R. Br.  
*Soria*, Adans.  
*Ochthodium*, DC.  
*Bunias*, Desv.  
*CARLID.Æ.*  
*Cakile*, Tournef.  
*Chorispora*, DC.  
*Chorispermum*, R. Br.  
*Cordyllocarpus*, Desf.  

## II. NOTORHIZÆ.

(0 ||).

*SISYMBRID.Æ.*  
*Malcolmia*, R. Br.  
*Citharoloma*, Bung.  
*Hesperis*, Linn.  
*Hesperidium*, DC.  
*Deilosma*, Andr.  
*Arabidium*, C. A. M.  
*Plagioloba*, C. A. M.  
*Dontostemon*, Andr.  
*Andreoskia*, DC.  
*Hesperidopsis*, DC.  
*Tongues*, Endl.  
*Pachypodium*, Webb et Berth.  
*Sisymbrium*, Linn.  
*Erysimum*, Tournef.  
*Fclarum*, DC.  
*Kluckia*, Andr.  
*Chamaelium*, Wallr.  
*Norta*, Adans.  
*Psilostylum*, DC.  
*Leptocarpæa*, DC.  
*Descurainia*, Webb et Berth.  
*Descurea*, Guett.  
*Sophia*, Hall.  
*Hugueninia*, Reichenb.  
*Kibera*, Adans.  
*Alliaria*, Adans.

*Arabidopsis*, DC.  
*Halimolobus*, Tausch.  
*Drabopsis*, Koch.  
*Tropidocarpum*, Hook.  
*Erysimum*, Linn.  
*Agonolobus*, C. A. M.  
*Cuspidaria*, Link.  
*Cheiropsis*, C. A. M.  
*Cheirinia*, Link.  
*Erysimastrum*, C. A. M.  
*Conringia*, Heist.  
*Gorinkia*, Presl.  
*Crantzia*, Lagasc.  
*Tetracme*, Bung.  
*Tetracratium*, DC.  
*Smelowskia*, C. A. M.  
*Taphrospermum*, C. A. M.  
*Braya*, Sternb. et Hopp.  
*Syrenopsis*, Jaub.  
*Leptaleum*, DC.  
*Christolea*, Camb.  
*Thelypodium*, Endl.  
*Pachypodium*, Nutt.  
*Stanleya*, Nutt.  
*Podolobus*, Rafin.  
*Warea*, Nutt.  
*CAMELINID.Æ.*  
*Syrenia*, Andr.  
*Stylonema*, DC.  
*Menkea*, Lehm.  
*Camelina*, Crantz.  
*Myagrum*, DC.  
*Leiolobium*, DC.  
*Stenopetalum*, R. Br.  
*Fudema*, H. B. K.  
*Mathewsia*, Hook.  
*Platypetalum*, R. Br.  
*Eutrema*, R. Br.  
*Aphragmus*, Andr.  
*Orobium*, Reichenb.  
*Oreas*, Cham.  
*Platyspermum*, Hook.  
*LEPIDID.Æ.*  
*Capsella*, Vent.  
*Marsypocarpus*, Neck.  
*Rodschiedia*, Gärtn.  
*Bursa*, Guett.  
*Hymenoclobus*, Nutt.  
*Ionopsidium*, Reichenb.  
*Bivonæa*, DC.  
*Eunomia*, DC.  
*Hutchinsia*, R. Br.  
*Nocera*, Reichenb.  
*Nasturtium*, Gray.  
*Iberidella*, Boiss.  
*Lepidium*, R. Br.  
*Kandis*, Adans.  
*Cardaria*, Desv.  
*Cardiopsis*, Wallr.  
*Jundzillia*, Andr.  
*Ellipsaria*, DC.  
*Bradyptium*, DC.  
*Cardamon*, DC.  
*Nesturtium*, Berth.







For further remarks upon the theory of Cruciferous structure, see Moquin Tandon, and Barker Webb in the *Mem. Acad. Toulouse*. These authors consider the flower as possessing a regular quaternary structure, the fruit itself being composed of 4 carpels; but they do not regard the horns of *Parolinia*, Fig. CCXLIV., as anything more than horn-like processes of the back of the carpels. The substance of their theory is as follows. "The examination of the structure of the fruit in *Escholtzia californica* induced Dr. Lindley to create an entirely new theory, to explain the position of the stigma and placenta.—*Bot. Reg.*, Vol. XIV. 1828, fol. 1168. He imagines that the intervals which separate the two placenta form each a carpellary leaf, reduced to its smallest dimensions and surmounted by its stigma; and that the two greater valves represent two other carpels exceedingly developed, whose stigmas and placenta are abortive. This very ingenious theory, which, though not true, presents a most seductive appearance of reality, has been generally accepted. Professor Kunth admitted and illustrated it with figures, adding a view of his own as to the nature of the dissepiment. This opinion by no means agrees with the observations on Embryogeny published by Trécul.—*Ann. des Sc. Nat.*, 2-ième Sér., Vol. XX. p. 339.

"Having explained the opinions of those who have gone before us, let us develop our own. The carpellary leaf (phyllidium) and its result, the carpel in reality, differ in appearance only from that of other polycarpous plants. Both reasoning and analogy have brought us to this conclusion; and its truth is confirmed by the monstrous flowers published by different authors.

"As in other carpellary leaves, the ovuliferous nerves, or placenta, are carried along the border of the leaf, and are modifications, in fact, of its lateral nerves. At their summit they form a two-headed stigma, whose two heads are separated by the depression resulting from the non-development of the middle nerve of the leaf. The two or more carpellary leaves which compose the ovary are exactly united by their placenta and stigmata; and the apparent stigma derived from their union is divided by the common canal resulting from the depression of both carpellary leaves con-founded together. The lateral lobes of each opposite carpellary leaf being thus brought together and forming an apparent whole, botanists supposed they had before them two stigmas in this order opposed to the placenta, which was contrary to all analogy.

"When the fruit is ripe, the placenta and stigmas of the two united carpels remain attached to each other, as well as the double spurious dissepiment,\* which they have projected to the middle of the fruit, or, in the *fenestrate* genera, to within a short distance of the axis, whilst the laminae of the leaves, transformed into valves, fall off. In the *Parolinia ornata* the summit of the carpel is protruded in the form of two narrow horns almost parallel, bifurcated at their extremity, much longer than the styles, but so like styles, that Dr. Lindley in his elaborate work (*Veg. Kingd.* p. 352.) has mistaken them for these. They are mere prolongations of the valves whereof they form part, and with which they fall off when the fruit is ripe, leaving the true stigmata attached to the placenta. A similar dehiscence is seen in *Papaveraceæ* and several *Capparids*. In the genus *Tetracellion*, where the capsule has assumed the normal tetramerous type, the fruit is nearly that of a Poppy, the chief difference consisting in the spurious dissepiments, which in this curious genus do not reach the axis. The dehiscence of *Tetracellion* is precisely the same as that of *Argemone mexicana*. The stigma is depressed in the middle, and it is not difficult to detach the carpellary leaves, so that each is surmounted by the portion of the collective stigma which belongs to it. One of us has found flowers of *Iberis* with 4 sepals, 4 petals, 4 stamens, and 3 or 4 carpels, the first in *Diplotaxis tenuifolia*, the second in *Lepidium sativum* and *Cheiranthus Cheiri*.—*Monstr. Vég.* p. 13 and 14, and 15, fig. 8, and following.

"Another analogy confirms our opinion. On examining the gynœceum of *Escholtzia californica*, which has four stigmas, we find that each pair surmounts a carpellary leaf; if we imagine each separate stigma of each pair to be united with its neighbour of the opposite pair, we obtain the two spurious stigmas of the greater part of Crucifers.

"If we call Teratology to our aid, we find that in all cases, where through monstrosity the pistil becomes foliaceous, the ovules are placed at the margin of the leaf; and if the stigma is formed, it is dicephalous and placed at the summit.—See

\* M. Trécul has shown that the dissepiment, originally simple, becomes double by the rupture lengthwise of the lax and elongated tissue of the interior cells.



*Engelm. de Anthol.* t. 4, f. 4, 5, 16, and 17. *Paul. in Lemm.* Vol. XVI. p. 200, t. 9. *Alph. D. C. Monst.* Vol. t. 5, f. 8.

The normal fruit of Crætifera is therefore composed of four sessile, diagonal crossways; the placentæ and the stigmas of each are united, and thus are separated from each other, more or less, by spurious dissepiments, each of them again often ripe by a valve, which separates marginally and longitudinally from the placentæ, which, together with the dissepiment, and furnished by the stigma in pericarpium in the greater number of species. Two of the carpels are constantly abortive.

A recapitulation of what has preceded, leads to the following conclusion: The floral type of Crætifera is quaternary. The calyx is composed of 4 lobes, the corolla of 4 petals, the receptacle has 4 staminiferous glands, the androecium 4 stamens, the gynoecium 4 pistils, and the fruit 4 carpels. These various organs regularly. Two stamens in the habitual state of the flower have been transformed into two pair by multiplication (*dédoublement*), and two pistils have disappeared by abortion; hence the androecium has two component parts more than it should have, the gynoecium two less. The four staminiferous glands are more or less irregular or incomplete, and are found above, below, or by the side of the filament. These changes have caused a change in the position of two stamens and of two sepals, which makes the androecium and calyx appear bicyrticulate."

## ADDITIONAL GENERA.

ARGENTÆ  
Alysiopsis *Engelm.*  
Bismadia *R. & B.*  
Muriestigma *Trin.*

ALYSSOIDE  
Pringlea *Engelm.*  
Cistaria *Engelm.*  
Bachmannia *Engelm.*  
Synalipia *Engelm.*

SEMPERVIRENTES  
Stachysyllis *Engelm.*  
Pachystachys *Engelm.*  
Grevillea *Engelm.*  
Stachysyllis *Engelm.*  
Zerdania *Engelm.*

CANDIDULE  
Entrepnea *Engelm.*  
Pachystachys *Engelm.*

TRISTIS  
Pachystachys *Engelm.*  
Tristis *Engelm.*  
Salsoloma *Engelm.*

MYRTICACE  
Hymenocallis *Engelm.*

FRAXINIFOLIA  
Fraxinifolia *Engelm.*

ROSEIFOLIA  
Roseifolia *Engelm.*

SEROTINA  
Guineya *Engelm.*  
Serotina *Engelm.*



## ORDER CXXIV. RESEDACEÆ.—WELDWORKS, or RESEDADS.

Resedaceæ, *DC. Théor. ed. 1.* 214. (1813); *Aug. de St. Hil. Ann. Soc. Roy. Orl. vol. 13.*; *Endl. Gen. clxxxiii.*; *Meisner, Gen. p. 18*; *Wight Illustr. 1.* 36.

DIAGNOSIS.—*Cistal Exogens*, with definite not tetradynamous stamens, not tetramerous flowers, exalbuminous seeds, and fruit usually open at the point.

Soft herbaceous plants, or in a few instances small shrubs, with alternate entire or pinnately divided leaves, and minute gland-like stipules. Flowers in racemes or spikes.



Fig. CCXLVII.

Calyx many-parted. Petals broad fleshy plates, having lacerated appendages at the back, unequal. Disk hypogynous, 1-sided, glandular. 2 Stamens definite, inserted into the disk; filaments erect; anthers 2-celled, opening longitudinally. Ovary sessile, 3-lobed, 1-celled, many-seeded, scarcely closed, usually with 3-6-parietal placentæ, sometimes surrounding a free central ovule-bearing body.\* Stigmas 3, glandular, sessile. 5 Ovules amphitropal or campulitropal. Fruit dry and membranous, or succulent, opening at the apex; or apocarpous, with empty carpels surrounding a central placenta; or even hooded and 1-seeded. Seeds several, reniform; embryo taper, arcuate, without albumen; radicle next the hilum.

The flowers of these plants, of which the common Mignonette may be taken as the type, differ in many respects from those of other Orders, especially in the presence of a very large glandular 1-sided plate, out of which the stamens grow, and in the petals bearing a great resemblance to that disk. This led me, in the *Collectanea Botanica*, and in the first edition of this work, to describe the structure of Weldworks, as consisting of an apparent calyx which was really an involucre, while the petals are abortive male flowers, and the disk a calyx of one central bisexual flower. I am, however, now convinced, by the arguments of Henslow, that this theory was erroneous, and I accordingly revert to the old view of the organisation and affinities of the Order. These latter are chiefly with Capparids, with which the seeds, the great disk out of which the stamens arise, and the parietal placentæ, agree.

All these plants are weeds inhabiting Europe, the adjoining parts of Asia, the basin of the Mediterranean, and the adjacent islands. A very few occur in the North of India, the Cape of Good Hope, and California.

Little more is known of their uses than that *Reseda luteola*, called Weld, yields a yellow dye, and that the Mignonette (*R. odorata*) is among the most fragrant of plants. They were once regarded as sedative, as is indicated by the word *Reseda*. They are generally sub-acrid; nevertheless *Reseda Phyteuma*, the *ῥήσιπρα* of the modern Greeks, is eaten as a kitchen esculent in the Greek Archipelago.

## GENERA.

*Ochradenus*, Delil.  
*Reseda*, Linn.  
*Luteola*, Tournef.

*Eresda*, Spach.  
*Oligomeris*, Cambess.  
*Resedella*, Webb et B.

*Elimia*, Nutt.  
*Holopetalum*, Turcz.  
*Astrocarpus*, Neck.

*Sesamoides*, Tournef.  
*Sesamella*, Reichenb.  
*Caylusea*, St. Hil.

## NUMBERS. GEN. 6. Sp. 41.

POSITION.—RESEDACEÆ.—Capparidaceæ.

Fig. CCXLVII.—*Reseda mediterranea*. 1. a flower seen from above, much magnified; 2. a section of the same, showing the great disk on one side of the ovary, and within which the stamens arise; 3. a cross section of the ovary; 4. a seed; 5. a section of it.

\* Not free-central, but reduced parietal, according to Webb.—*Hook. Journ. II.* 311.



## ORDRE CXXV. CAPPARIDACEÆ. — CLEOMEÆ.

Capparid. *Jour. bot. bot.* (1789), *Ann. Mus. Nat. Hist. Nat. France* (1827), *Recht. nat. France*.Meyenb., *Ann. p. 17*, *Recht. nat. France* 2, 3.DIAGNOSIS. — *Catalpa* *Engelm.*, with terminal and lateral racemes, glabrous, strongly pubescent, or tomentose, and a flower of five.

Herbaceous plants, shrubs, or even trees, without true stipules, but sometimes with spurs in their place. Leaves alternate, stalked, undivided, or palmate. Flowers axillary.

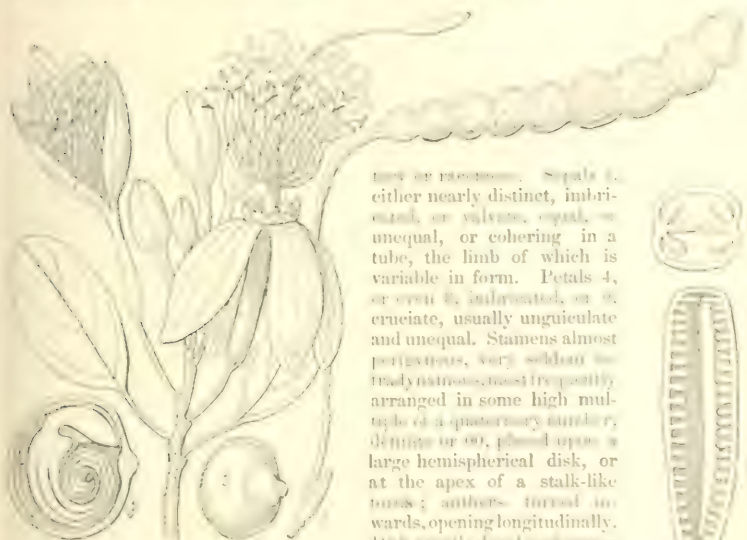


FIG. CCXLVIII.

cal, fleshy, or stalk-like body, sometimes as a noncartilaginous glandular plate of various forms, sterile on one side and anther-bearing on the other. Ovary stalked, or sessile, 1-celled, with 2 or more parietal placentae; ovules amphitropal or campylotropal; style 0, or filiform; stigma generally round. Fruit either pod-shaped and dehiscent, or baccate, fleshy, unguiculate, 1-seeded, most frequently with polyspermous placentae. Seeds generally reniform, without albumen, but with the lining of the testa tumid, attached to the margin of the valved coat or curved; cotyledons foliaceous, flattish; radicle taper, short or long, turned to the side.

Distinguished from Crucifers by their stamens being often didymous, if not monadelphous, tetradynamous, or scarcely even, and by their reniform seeds. They are nearest to Passionworts in their stipitate ovary, and fleshy indehiscent fruit with glandular placentae; and to Euxals in the structure of their fruit, parietal placentae, and didymous stamens; from these last they are removed by their entire placentae, and albuminous seeds, and peculiar habit; and from the former by a number of obvious characters. Brown remarks (*Journal*, 1816) that some species of *Capparis*, of which *C. spinosa* is an example, have as many as a placentae. Aug. de St. Hilaire and Moench Tandon state that Capparids are referable to a tetrandrous type, which is not possible. But the explanation they give, or the process they refer it to, are not that they could be desired. (See *Ann. bot. Sci.* 70, 501).

Capparids are chiefly found in the tropics and in the southern half of our continent, where they abound in almost every direction. Of the peculiar species, a single one, *Cleome violacea*, is found in Portugal; another, *Polemon pruvencense*, occurs as far as the north as Canada; and one or two others are met with in the western portion of the United States. Of the fleshy-fruited tribe, the common *Capparis*, *Capparis plumosa*, a native of the most southern parts of Europe, is that which approaches the nearest to the north. Africa abounds in them.

FIG. CCXLVIII. — *Morus quadrifida*. 1. Flower; 2. Fruit; 3. Seed; 4. Seedling.FIG. CCXLIX. — *Capparis* *Sp.* 1. A branch; 2. A flower; 3. A fruit; 4. A seedling.



De Candolle compares Capparids with Crucifers in regard to their sensible qualities; and they no doubt resemble each other in many respects; for instance, the flower-buds of the Caper (*Capparis spinosa*, *rupestris* in Greece, *Fontanesii* in Barbary, and *ægyptiaca* in Egypt) are stimulant, antiscorbutic, and aperient, and form a well-known pickle; the bark of the root passes for a diuretic; and some species of *Cleome* and *Polanisia* have a pungent taste, like that of mustard; the root of *Polanisia icosandra* is used as a vermifuge in the United States, in Cochin China as a sinapism. The bark of the root of *Cratæva gynandra* (the Garlick Pear) blisters like *Cantharides*; so does that of *Capparis cynophallophora*, *amygdalina*, and *ferruginea*. But on the other hand the pungent principle becomes in some cases so concentrated as to be dangerous. *Colicodendron Yeo* is said by Martius to be dangerous to mules and horses. There is a plant called *Fruta de Burro*, found in the neighbourhood of Carthage, the fruit of which is extremely poisonous; it is supposed to be a species of *Capparis*, nearly allied to the *C. pulcherrima* of Jacquin; and must not be confounded with the *Fruta del Burro* of Humboldt, found in Guiana, which is a valuable medicinal plant, belonging to *Anonads*. Although they are in general plants of small dimensions, yet from *Cratæva excelsa* the people of Madagascar, who call it *Vouën pouën*, cut planks as much as four feet broad, according to Bojer.—*Ann. Sc. N. N. S.* xx. 58. The bruised leaves of *Cratæva Tapia* are used in Brazil against inflammation; its bark is bitter and tonic. *Capparis Solada* has a narcotic odour, and its acrid stimulating fruits are employed by women to produce fecundity. The root of *Cadaba indica* is said to be aperient and anthelmintic. The juicy berries of *Cratæva Nurvala* are said to be agreeable.

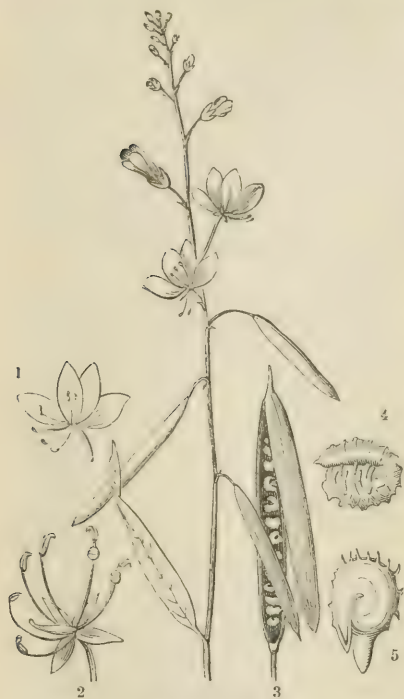


Fig. CCXLIX. bis.

## GENERA.

I. CLEOMEÆ.—Fruit a capsule.	<i>Polanisia</i> , Raf.	<i>Desmocarpos</i> , Wall.	<i>Utrervia</i> , Bert.
<i>Cleomella</i> , DC.	<i>Corynandra</i> , Schrad.	<i>Thylacium</i> , Lour.	<i>Breyniastrum</i> , DC.
<i>Gynandropsis</i> , DC.	<i>Rammanissa</i> , Endl.	<i>Niebuhria</i> , DC.	<i>Breynia</i> , Plum.
<i>Gymnogonia</i> , R. Br.	<i>Cyrbasium</i> , Endl.	<i>Boscia</i> , Lam.	<i>Busbeckea</i> , Endl.
<i>Cleome</i> , DC.	<i>Cristatella</i> , Nutt.	<i>Podoria</i> , Pers.	<i>Morisonia</i> , Plum.
<i>Sinapistrum</i> , Mönch.	<i>Isomeris</i> , Nutt.	<i>Streblacarpus</i> , Arnott.	<i>Cratæva</i> , Linn.
<i>Pedicularia</i> , DC.	<i>Dipterygium</i> , Decaisne.	<i>Maerua</i> , Forsk.	<i>Othrys</i> , Noronh.
<i>Atalanta</i> , Nutt.	<i>Pteroloma</i> , St.	<i>Colicodendron</i> , Mart.	<i>Ritchiea</i> , R. Br.
<i>Peritoma</i> , DC.		<i>Calanthea</i> , DC.	<i>Steriphoma</i> , Spreng.
<i>Siliquaria</i> , Forsk.	II. CAPPAREÆ.—Fruit a berry.	<i>Quadrifolia</i> , DC.	<i>Römeria</i> , Tratt.
<i>Roridula</i> , Forsk.	<i>Schepperia</i> , Neck.	<i>Capparis</i> , Linn.	<i>Stephania</i> , Willd.
<i>Rorida</i> , Röm. et Sch.	<i>Macromerum</i> , Burch.	<i>Sodada</i> , Forsk.	<i>Tovaria</i> , Ruiz et Pav.
<i>Dactylæna</i> , Schrad.	<i>Atamisquea</i> , Miers.	<i>Hombuck</i> , Adans.	<i>Singana</i> , Aubl.
<i>Physostemon</i> , Mart. et Zucc.	<i>Cadaba</i> , Forsk.	<i>Lindackera</i> , Sieb.	<i>Sterebeckia</i> , Schreb.
	<i>Stromia</i> , Vahl.	<i>Capparidastrum</i> , DC.	<i>Hermupoa</i> , Lefl.
		<i>Cynophalla</i> , DC.	<i>Roydsia</i> , Roxb.

*Oxystylis*, A. Gray.  
*Wislizenia*, Engelm.

NUMBERS. GEN. 28. Sp. 340.

*Beautempsia*, Gaudich.  
*Destrugesia*, do.

Passifloraceæ.

POSITION.—*Brassicac. a.*—CAPPARIDACEÆ.—*Resedaceæ.**Flucourtiaceæ.*

Fig. CCXLIX. bis.—*Physostemon lanceolatum*. 1. a flower of the natural size; 2. the calyx, stamens, and ovary; 3. the ripe fruit, with one valve separating; 4. a seed; 5. the same cut vertically, to show the incurved embryo.



# ANNEXE XXVIII. MALVACEÆ. — THE MALVAL ALIANCE.

DIAGNOSIS. — *Hypogynous Exogens*, with *monodelphous flowers*, *ovary* *subsuper-*  
*stitious* *inferior*, an *indurated* *or* *valvate* *pericarp*, *epicarp* *of* *90* *segments*, and *embryo*  
*with* *little* *or* *no* *albumen*.

This Alliance is little else than the old Order of Malvæ or Compositæ, with the addition of Indian Crosses and Verbenaceæ. The limit of it is determined by the valvate calyx in combination with a twisted or much indurated ovary, if megaspermia be present. The Sterculiaceæ, with their long-stalked ovary, indicate an approach to the very edge of Caprifoliæ, whose ovary is sometimes valvate; and on the other end of the scale the Umbelliferae are not unaptly brought into contact with the Parnassia (Ternstroemiaceæ), which are also valvate.

It is not, however, with Sapindaceæ that Malvæ are most allied: they claim a more nearer affinity to Geraniaceæ, which differ in their indurated ovary more than in anything else, and to which the Indian Crosses form a direct transition. But I have succeeded in bringing together the Alliances of Hypogynous Exogens, so as to allow Geraniaceæ to follow or precede Malvæ. There is also another kind of relationship on the part of Malvæ, equally strong, and equally impossible to describe literally: namely, with Sparganiaceæ, which Sterculiaceæ and Hydnoraceæ (especially the latter) quite touch at several points.

The real position of the Malval Alliance may therefore be expressed somewhat in the following manner:—

Sterculiaceæ. — Hydnoraceæ. — Vivianaceæ. — Ternstroemiaceæ. — Malvaceæ. — Parnassiacæ.  
*Euphorbiaceæ.* *Chamædriaceæ.*

## NATURAL ORDERS OF MALVACEÆ.

<i>Stamens</i> <i>columnate</i> , <i>all</i> <i>perfect</i> . <i>Anthers</i> <i>2-celled</i> , <i>twined</i> <i>jointly</i> . 100	<i>Simarubaceæ</i>
<i>Stamens</i> <i>monodelphous</i> , <i>in</i> <i>most</i> <i>cases</i> <i>partly</i> <i>stam.</i> <i>Anthers</i> <i>2-celled</i> , <i>twined</i> <i>jointly</i> . . . . .	127 <i>Hydnoraceæ</i>
<i>Stamens</i> <i>free</i> . <i>Disk</i> <i>none</i> . <i>Seeds</i> <i>with</i> <i>albumen</i> . <i>Embryo</i> <i>curved</i> . . . . .	
<i>Stamens</i> <i>free</i> . <i>Disk</i> <i>none</i> . <i>Seeds</i> <i>without</i> <i>albumen</i> . <i>Embryo</i> <i>curved</i> . . . . .	100 <i>Vivianaceæ</i>
<i>Stamens</i> <i>free</i> . <i>Disk</i> <i>none</i> . <i>Seeds</i> <i>without</i> <i>albumen</i> . <i>Embryo</i> <i>curved</i> . . . . .	100 <i>Parnassiacæ</i>
<i>Stamens</i> <i>columnate</i> , <i>all</i> <i>perfect</i> . <i>Anthers</i> <i>1-celled</i> , <i>separated</i> <i>jointly</i> . 100	
<i>Stamens</i> <i>free</i> , <i>on</i> <i>the</i> <i>surface</i> <i>of</i> <i>disk</i> . <i>Seeds</i> <i>with</i> <i>albumen</i> . <i>Embryo</i> <i>straight</i> . . . . .	127 <i>Simarubaceæ</i>



## ORDER CXXVI. STERCULIACEÆ.—STERCULIADS.

Sterculiaceæ, *Vent. Malm.* 2. 91. (1799); *Endl. Meletem.* p. 30.; *Gen. vex.*; *Meisner, Gen.* p. 28.—*Bombacææ, Kunth. Diss. Malv.* p. 5. (1822); *DC. Prodr.* 1. 475.; *A. St. Hilaire Fl. Br. Merid.* 1. 275; *Ed. pr.* No. 26. (1830); *Wight Illustr.* 1. p. 66.

DIAGNOSIS.—*Malval Exogens with columnar stamens all perfect, and 2-celled anthers turned outwards.*

Large trees or shrubs. Hairs, if present, stellate. Leaves alternate, simple or compound, sometimes digitate, often toothed, with free deciduous stipules. Inflorescence variable. Flowers regular or irregular, frequently ♂ ♀ by abortion. Calyx either naked or surrounded with an involucre, consisting of 5 sepals, more or less united at the base, with a valvate or nearly valvate æstivation, except where the calyx is irregularly ruptured. Petals 5, (or none), hypogynous, convolute in æstivation. Stamens indefinite, monadelphous in various ways; anthers 2-celled, turned outwards, sometimes anfractuose. Pistil consisting of 5, or rarely 3, carpels, either distinct or cohering into a single ovary, often seated upon a column-like axis. Styles equal in number to the carpels, distinct or united; ovules orthotropical or anatropal, erect if definite; sometimes indefinite. Fruit capsular, with 3 or 5 cells, or even drupaceous or berried, or composed of distinct follicles, opening by the ventral suture long before the ripening of the seeds. Seeds ovate or angular, sometimes winged or woolly; albumen oily or fleshy, rarely wanting; embryo straight or curved; cotyledons either foliaceous, flat, and plaited, or rolled round the plumule, or else very thick, but this only in the seeds without albumen; radicle next the hilum, or at the opposite end of the seed, or even transverse.



Fig. CCL.

These have the columnar stamens of Mallowworts, and therein exhibit a near approach to that Order; but their anthers are 2-celled, and turned outwards. Sterculiads also lie on the borders of Byttneriads, from which they are readily distinguished by their columnar stamens not being partially sterile, and by the anthers being turned outwards. The Sub-Order Bombacææ is remarkable for having a tough leathery calyx, which sometimes splits irregularly so as to hide the true manner in which the sepals are arranged. The fruit of Sterculia often exhibits beautiful illustrations of the real nature of that form of fruit which Botanists call the follicle, and helps to demonstrate that it, and hence all simple carpels, are formed of leaves, the sides of which are inflexed, and the margins dilated into placentæ bearing ovules. In *Firmiana platanifolia*, in particular, the follicles burst and acquire the form of coriaceous leaves, bearing the seeds upon their margin.

According to Dr. R. Brown, the Sub-Order Sterculææ is remarkable for the different positions taken by the radicle within the seed; although in the majority it is at the extremity most remote from the hilum, yet in others it is next the hilum, and in some transverse with respect to that part, an unusual circumstance in the same Natural Order.—*Pl. Javan.* p. 224.

Nearly all the known species are tropical, or at least natives of very warm climates. They are extensively scattered over the world, the Sterculææ preferring India and Africa, the Bombacææ America; Helicterææ seem to be unknown in Africa. The Baobab trees are from Senegal, where they are remarkable for their enormous size and prodigious longevity, estimated, but no doubt incorrectly, to amount in certain instances to some thousand years. The various species of *Bombax* and *Ceiba* are prodigious American

Fig. CCL.—*Helicteres brevispira*.—*A. St. Hilaire*. 1. a column of stamens; 2. an anther; 3. a pistil; 4. a ripe fruit.







III. STERCULIÆ. —  
Leaves simple or pal-  
mate. Flowers uni-  
sexual by abortion.

*Heritiera*, Ait.  
*Balanopteris*, Gärtn.  
*Sutherlandia*, Gmel.  
*Samandura*, Linn.  
*Aturus*, Rumph.  
*Sterculia*, Linn.

*Clompanus*, Rumph.  
*Ivira*, Aubl.  
*Theodoria*, Neck.  
*Chichea*, Presl.  
*Maleatia*, Fl. Flum.  
*Southwellia*, Salisb.  
*Balanghas*, Burm.  
*Cavalam*, Rumph.  
*Cavallium*, Sch. et Endl.  
*Triphaca*, Lour.

*Astrodendron*, Dennst.  
*Brachychiton*, Schott.  
*Pecilotermis*, Id.  
*Trichosiphon*, Id.  
*Hildegardia*, Sch. et Endl.  
*Cola*, Bauh.  
*Lunana*, DC.  
*Edwardia*, Raf.  
*Bichy*, Lunan.

? *Culhamia*, Forsk.  
*Scaphium*, Sch. et Endl.  
*Firmiana*, Marsigl.  
*Erythropsis*, Lindl.  
*Pterygota*, Scht. et Endl.  
*Tetradia*, R. Br.  
*Pterocymbium*, R. Br.  
*Courtenia*, R. Br.  
*Micrandra*, R. Br.

NUMBERS. GEN. 34. Sp. 125.

POSITION.—*Malvaceæ*.—*Ternstroemiaceæ*.  
—*STERCULIACEÆ*.—*Byttneriaceæ*.  
*Capparidaceæ*.

#### ADDITIONAL GENERA.

*Delabechea*, Mitchell, to *Sterculæ*.  
*Boschia*, Krthls. to *Bombacæ*.  
*Covillhamia*, Krthls.

A substance called Oadul is obtained in India from *Sterculia villosa*, and manufactured into ropes of excellent quality. From the bark of *Sterculia guttata* a cloth is made in Malabar.—*Hooker*.

From the fibre of *Adansonia digitata* the Changallas and Chohos, in whose country the tree is common, manufacture caps and hoods. The latter, which are waterproof, are used as articles of dress, and as drinking-vessels. Cordage and sashes are also prepared from this substance.—*Ach. Richard*.



## OILS, CANVAS, BY THE RICE OF THE BAY OF BAHAMA

[11] J. J. Conner, R. H. Fox and T. J. Lavin, *Quasilinear PDEs*, *Int. J. Numer. Anal.* 1 (1981), no. 1, 1-12; *Internat. Math. Res. Notices* 1 (1981), no. 1, 1-12; *Math. Ann.* 241 (1981), no. 3, 271-282.

**Diagnosis:** *Metast. Elliptica*, with noncylindrical stamens, stamens  $2 \times 1$ , and 2-lobed mother's tongue inside.

Trees, shrubs, or undershrubs, occasionally with a climbing habit; the outer surface covered with stellate or forked hairs, occasionally with scurf. Leaves alternate, palmate

cal, commonly notched at the edge; stipules deciduous, in a few instances 0. Flowers often in clusters, but also in spikes or panicles. Calyx herbaceous, membranous, or leathery, 2-lobed, valvate in aestivation. Corolla 0, or consisting of as many petals as there are lobes to the calyx, either flat, but twisted in aestivation, or arched and drawn out into a strap; folded inwards at the edges and valvate in aestivation; either permanent or deciduous, often adhering to the tube of stamens. Stamens hypogynous, definite and opposite the petals, or twice as many and half only fertile and opposite the petals, or 00, as many being barren as there are sepals, and opposite them; almost always united into a cup or tube; anthers turned inwards, 2-lobed, opening lengthwise, very rarely by a pore or cleft near the point. Ovary free, sessile, or on a short stalk, composed of from 1 to 10 carpels arranged round a central column, or reduced to one only; ovules 2 in each cell, anatropal, ascending, or nearly horizontal, or even pendulous; styles numerous.

consolidated; stigmas equal in number to the cells. Fruit generally 2-angled, sometimes 3-angled, through the cells or resolving itself into its original elements by sucking out the partitions; seeds sometimes winged, but generally round. Embryo generally large, in a small quantity of fleshy or mucilaginous albumen, straight or bent; cotyledons fleshy or generally leafy, entire or split, plaited or folded up, straight or curved, next the hilum.

Byttneriads are often united with Sterculiads, since both have a similar structure of the stamens, with the anthers turned inwards, and, excepting the Solanaceae, Maraceae, and Eriodendreae, the stamens partially superior, sublonger than the corolla. The revolved anthers and not columnar stamens distinguish them from Malvaceae. The tendency to a loss of petals, an abortion of the thalamus and a very short style

Fig. 6. C. 11.1. *Hydroena colubialis* (a) St. W. 1; (b) expanded to 100% of size of maximum; (c) modified Stomoxys 4, 1952 [2].

4 is a convex  $\delta$ -section of a solid.



1. 0011





sexes, which is so frequently observable in Sterculiads and Byttneriads, is an indication of a lower degree of organisation than occurs among Mallowworts, and clearly brings the Malval into contact with the Euphorbial Alliance.

These are wholly tropical, or from temperate climates. The Lasiopetaleæ are Australasian, Hermanneæ are South African, Dombeyæ African and Asiatic, Eriolænæ exclusively Asiatic, and Philippodendreæ from New Zealand, (not Nepal, as has been stated by Mr. Poiteau); Byttneræ are both Asiatic and American.

Beyond all other products Cacao or Cocoa, the chief ingredient in Chocolate, is remarkable in this Order. It is the seed of Theobroma Cacao, a small tree of which whole forests occur in Demerara. An ardent spirit is distilled from the pulp of the fruit. The Waltheria Douradinha is used in Brazil as a remedy for venereal disorders, for which its very mucilaginous nature renders it proper. The fruit of Guazuma ulmifolia is filled with a sweet and agreeable mucilage, which the Brazilians suck with much pleasure. In Martinique the young bark is used to clarify sugar, for which the copious mucilage it yields when macerated qualifies it. In the same island the infusion of the old bark is esteemed as a sudorific, and useful in cutaneous diseases. The bark of Kydia calycina is applied in India to the same purpose. The fibrous tissue of the bark of many species is so tough as to be well adapted for manufacturing into cordage; this is more especially the case with Microlena spectabilis, and Abroma augustum. The bark of Dombeya spectabilis is made into ropes in Madagascar. The Pterospermums are all mucilaginous.

#### GENERA.

##### I. LASIOPETALEÆ.

Seringia, Gay.  
Gaya, Spreng.  
Guichenotia, Gay.  
Thomasia, Gay.  
Leucothamnus, Lindl.  
Lasiopetalum, Smith.  
Corethrostylis, Endl.  
Keraudrenia, Gay.  
Sarotes, Lindl.

##### II. BYTTNEREÆ.

Rulingia, R. Br.  
Commersonia, Forst.  
? Medusa, Lour.  
Jürgensia, Spreng.  
Abroma, Jacq.  
Ambroma, Linn. f.  
Hastingia, König.  
Byttneria, Löffl.  
Chetrea, Jacq.

Heterophyllum, Boj.  
Telfairia, Newm.  
Ayenia, Linn.  
Dayenia, Mill.  
Herrania, Goudot.  
Lightia, Schomb.  
Theobroma, Linn.  
Cacao, Tournef.  
Guazuma, Plum.  
Bubroma, Schreb.  
Kleinhovia, Linn.  
Actinophora, Wall.  
Pentaglottis, Wall.

##### III. HERMANNEÆ.

Waltheria, Linn.  
Lophanthus, Forst.  
Astropus, Spreng.  
Melochia, Linn.  
Riedlea, Vent.  
Riedlea, DC.  
Althelia, Thouars.

Lochenia, Arn.  
Physodium, Presl.  
Hermannia, Linn.  
Mahernia, Linn.

##### IV. DOMBEYÆ.

Ruizia, Cav.  
Astyria, Lindl.  
Pentapetes, Linn.  
Moranda, Scop.  
Brotera, Cav.  
Sprengelia, Schult.  
Vialia, Vis.  
Assonia, Cav.  
Königia, Commers.  
Vahlia, Dahl.  
Dombeya, Cav.  
Paulowilhelmia, Hochst.  
Xeropetalum, Delil.  
Leeuwenhoeckia, E. Mey.  
Melhania, Forsk.  
Astrapea, Lindl.  
Hilsenbergia, Boj.

Glossostemon, Desfont.  
Trochetia, DC.  
Pterospermum, Schreb.  
Velago, Adans.  
Velago, Gärtner.  
Pterolæna, L.C.  
Kydia, Roxb.

##### V. ERIOLÆNEÆ.

Eriolæna, DC.  
Schillera, Reichenb.  
Microlena, Wall.  
Wallichia, DC.  
Jackia, Spreng.  
? Visenia, Houtt.  
Wisenia, Gmel.  
Aleurodendron, Reinw.  
Glossospermum, Wall.  
? Exitelia, Blum.  
Maranthes, Blum.  
VI. PHILIPPODENDREÆ.  
Philippodendron, Poit.

NUMBERS. GEN. 45. Sp. 400.

POSITION.—Sterculiaceæ.—BYTTNERIACEÆ.—Tiliaceæ.  
Euphorbiaceæ.

#### ADDITIONAL GENERA, &c.

Cardiostegia, Presl, near Melhania.  
Melhania = Brotera, according to Webb.

Rhynchostemon, Stetz, near Lasiopetalum.  
Macarthuria, Endl. near Byttneria.



# ORDER CXXXVIII. VIVIANIACEÆ. VIVIANIACEÆ.

Vivianaceæ, *Rhizomæ in Europa, lat. 40°* (1850). *Boissier, Cat. 362, 363, 364, 365, 366.*

**DIAGNOSIS.**—*Herbal Fraxinea, with five grooved, or dilated, seeds with albumen, a curved embryo, permanent petals, and without calyx.*

Herbaceous or half-shrubby plants. Leaves opposite or whorled, entire or serrated, without stipules, often cuneate beneath with a hairy down. Flowers in cymes or

corymbs, white, red, or pink. Calyx unperforated, with 2 narrow divisions. Petals 5, hypogynous, furnished with stamens often drawn up and remaining permanently round the withered ovary, with twisted aestivation. Stamens 10, hypogynous; those opposite the sepals inserted into a fleshy gland; filaments distinct; anthers 2 celled, opening lengthwise. Ovary free, 3-celled; stigma 3, sessile; ovules 2 in each cell, attaching to the central axis, one ascending, the other suspended. Capsule

3-lobed, 3-celled, splitting through the cells; the suture bearing the peritomes in the middle. Seeds reniform, containing a curved embryo lying among a large quantity of fleshy albumen; cotyledons linear; radicle next to the hilum.

The few plants which recent writers have assigned into this Natural Order, have been generally gathered in some place in the Geranial Alliance, from all which they are distinguished by their valvate calyx; from *heller Crosses* (*Trigonostemon*) they are distinguished by their small albuminous seeds, and regular flowers, from *Hall lowwoods*, &c. by their not having succulent stems. Their ribbed calyx and permanent withering corolla are quite peculiar. It may be that we have now no approach to *Frankenels*.

All the members of this Order, which have yet been discovered inhabit Chili and South Brazil.

They are not reported to possess any useful properties; but the *Vivianæ* would be pretty agreeable plants, if they could be procured.



FIG. CCLIII

## GENERA

*Gerania*, *Crotalaria*,  
*Viviania*, *Croton*,  
*Morone*, *Frankia*,  
*Amorpha*, *Hibiscus*.

*Crotalaria*, *Croton*,  
*Frankia*, *Hibiscus*.

NATURAL GEN. 4. 8. 11.

POSITION. THRECE. — VIVIANIACEÆ. — THRECE.

FIG. CCLIII. — *Viviania cuneata*. — *Fig. 1* shows a specimen of the flower. *Fig. 2* shows a seed.



## ORDER CXXIX. TROPÆOLACEÆ.—INDIAN CRESSES.

*Tropæoleæ*, Juss. *Mem. Mus.* 3. 447. (1817); *DC. Prodr.* 1. 683. (1824); *Endl. Gen.* cclviii. — *Limnanthæ*, R. Br. in *Lond. and Edinb. Philosoph. Mag.* July 1833; *Lindley Bot. Reg.* t. 1673. (1834); *Nixus Plantarum*, p. 11. (1833); *Martius Conspectus*, No. 272. (1835); *Endl. Gen.* cclix.

DIAGNOSIS.—*Malval Exogens*, with free stamens, no disk, seeds without albumen, and an amygdaloid embryo.

Smooth herbaceous plants, of tender texture and with an acrid taste, trailing or twining. Leaves alternate, without stipules. Peduncles axillary, 1-flowered. Flowers

yellow, scarlet, orange, or even blue ! Sepals 3-5, the upper one with a long distinct spur ; aestivation usually valvate, or very slightly overlapping. Petals 1-5, hypogynous, equal or unequal, with a convolute aestivation, sometimes partially abortive. Stamens 6-10, perigynous, distinct ; anthers innate, erect, 2-celled. Ovary 1, 3-cornered, made up of 3 or 5 carpels ; style 1 ; stigmas 3-5, acute ; ovules solitary, erect, or pendulous. Fruit indehiscent, the pieces separable from a common axis, sometimes winged. Seeds large, without albumen, filling the cavity in which they lie ; embryo large ; cotyledons 2, straight, thick, consolidated into a single body, or distinct ; radicle next the hilum.

Indian Cresses form an Order standing on the limits between the Malval and Geranial Alliances. Its valvate calyx is almost the only character which determines its preference for the former ; for if that were imbricated and ribbed there would be little to separate Indian Cresses from the Cranesbills. *Tropæolum majus* has the very spur of a *Pelargonium*, only in the latter the spur is adnate to the flower-stalk. *Limnanthes*, which Dr. Brown first proposed as a distinct Order, do not seem to be naturally distinguished, and, considering the very small extent of the Order of Indian Cresses, are far better combined with them. If the leaves of *Limnanthes Douglasii* and *Tropæolum majus* are chewed, their flavour is so similar that one is hardly able to distinguish them. The principal difficulty in the way of stationing *Limnanthes* with Indian Cresses, consists in the perigynous insertion of the stamens of the former ; but in this instance other considerations must, I think, outweigh that circumstance. Perhaps *Limnanthes* should



Fig. CCLIV.

Fig. CCLIV.—1. *Chymocarpus pentaphyllus* ; 2. a longitudinal section of its flower ; 3. ovary of *Tropæolum majus* ; 4. a vertical section of a carpel, showing the position of the ovule ; 5. a perpendicular section of a seed.



be regarded as an approach to Ruessowia, the one being, and Neltvedia the other, because of its deeply lobed pistil; but this is probably a similarity of habit only.

All are natives of the temperate part of North and South America.

The fleshy fruit of *Tropaeolum majus* is a herb, and possesses the properties of Cress; and De Cuvillier remarks, that the caterpillar of the Cabbage butterfly feeds exclusively upon Crucifers and Tropaeodum. The root of *T. tuberosum* is eaten in Peru. Chymocarpus is used in Brazil as an antiseptic, under the Portuguese name of Chagas da Munda. Lindley has all the peculiar pungency of a Tropaeodum.

#### GENERA.

*Tropaeolum*, Linn.  
—one irregular. — *Cruciferae*  
—pandemon.

*Tropaeolum*, L.  
*Mouliana*, Gray.  
*Chymocarpus*, Don.  
*Persea*, Moench.

*T. tuberosum*, —  
*Tropaeolum*, — *Cruciferae*  
— *Cruciferae*.  
*Chymocarpus*, R. & B.  
*Persea*, M.



Fig. CCLV.

NUMBERS. GEN. 5. Sp. 43.

POSITION. Vivianaceae. — *Tropaeolum*, L.  
*Neltvedia*, Gray.

Fig. CCLV.—Flower of *Tropaeolum majus*, showing the stamens.



## ORDER CXXX. MALVACEÆ.—MALLOWWORTS.

Malvaceæ, *Juss. Gen.* 271. (1789) *in part.*; *Brown in Voy. to Congo*, p. 8; *Kunth. Diss.* p. 1; *DC. Prodr.* 1. 429. (1829); *Endl. Gen. ceix.*; *Meisner, Gen.* p. 26.; *Wight. Illustr.* 1. p. 55.

DIAGNOSIS.—*Malval Exogens*, with columnar stamens all perfect, and 1-celled anthers turned inwards.

Herbaceous plants, trees, or shrubs. Leaves alternate, more or less divided, stipulate. Hairs stellate if present. Peduncles usually axillary. Flowers showy, often inclosed in an involucre of various forms. Sepals 5, very seldom 3 or 4, more or less united at the

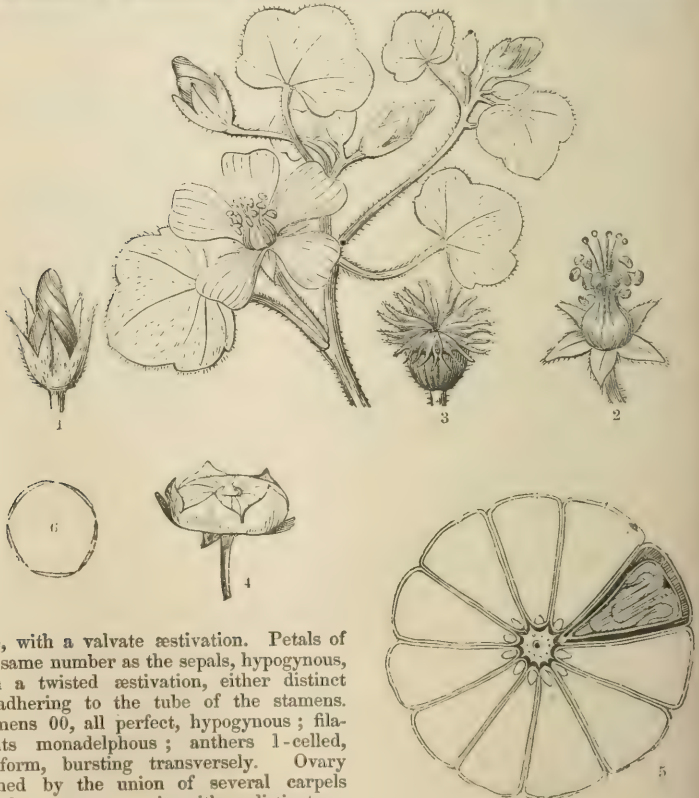


Fig. CCLVI.

base, with a valvate æstivation. Petals of the same number as the sepals, hypogynous, with a twisted æstivation, either distinct or adhering to the tube of the stamens. Stamens ∞, all perfect, hypogynous; filaments monadelphous; anthers 1-celled, reniform, bursting transversely. Ovary formed by the union of several carpels round a common axis, either distinct or united; ovules definite or indefinite, attached to the inner angle of the cells, amphitropal or semianatropal; styles the same number as the carpels, either united or distinct; stigmas variable. Fruit either capsular or baccate, its carpels being either monosper-

Fig. CCLVI.—*Abutilon macropodum*. 1. an unexpanded flower; 2. the stamens and styles; 3. a ripe fruit, consisting of many carpels, whose upper extremities are free and radiant; 4. a ripe fruit of the *Malva sylvestris*, natural size; 5. a transverse section of the same fruit, from which all the seeds have been taken except one, which is seen at C; 6. a section of a calyx, showing its valvate structure.



mous or polyspermeous, sometimes united in one, sometimes separate or aggregated in distinct cones or heads; adaxial or other kind of lobes or segments; thick laminae; large or small flowers, or fleshy just as small quantity; lobes or segments, either terminal or axillary.

The relation of Malvaceæ with Scrophulariæ, Labiales, and Hydrangeæ is clearly indicated by their general resemblance in structure, combined with the common attraction of their calyx. A less immediate affinity is indicated with Compositæ by means of the curious genus *Malope*, whose corolla are separate and united in considerable numbers over a central torus, although its organization is in all other respects that of Malvaceæ. There also seems to be a considerable degree of relationship between them and Cranesbills, Chenopods, and Flacourtiæ. To the first they approach by their monadelphous stamens and campanulate calyxes; to the second by their anthers and columnar stamens; to the third by the twisted corollas, and mucilaginous properties. The whole of these Orders are, however, sufficiently distinguished by the characters already assigned to them in their proper places. Theads (Ternstroemiaceæ) are another Order to which Malvaceæ have been occasionally compared; but the slightly monadelphous condition of the stamens in that Order is very different from their columnar structure in Malvaceæ, and there is little else in common between them.

These plants are found in great abundance in the tropics, plentifully in the hotter parts of temperate regions, but gradually diminishing to the north. Thus in early flowering plants, in India  $\frac{1}{2}$ , in Southern  $\frac{1}{2}$ , in Lapland they are unknown, in the temperate parts of North America  $\frac{1}{2}$ , in the equatorial parts of the same continent  $\frac{1}{2}$ ; or fading into account only the vegetation of the valleys, they, according to Humboldt, form  $\frac{1}{2}$  of the flowering plants in the tropics,  $\frac{1}{2}$  in the temperate zone, and are not found in the frigid zone. But these calculations no doubt include Sterculiads.

The uniform character of the Order is to be found in nature, and to be really destitute of all unwholesome qualities. The use to which Malvæ and Marshmallows are applied in Europe is well known. The whole plant of the latter, especially the root, yields in decoction a plentiful, tasteless, colourless mucus, salutary in cases of irritation. It is used as a demulcent for children, and is a favourite medicine with the French, who employ it constantly in pastes, lozenges, &c., under the name of Guimauve. The flowers of the gaudy Hollyhock (*Alcea rosea*, *Alcea rosea*) are official in Greece for the same purposes. Similar properties are possessed by extra-European species. *Sida cordifolia* mixed with rice is used to allay the bloody flux. Emollient fomentations are prepared from *Sida mauritiana* by the Indian doctors. The flowers of *Benjain de Dios*, *Abutilon esculentum*, are used by itself as a mild vegetable. A decoction of *Sphærandra asplatica* is administered in the same country in inflammation of the bowels, and is generally employed for the same purpose in the Marshmallow in Europe. *Pavonia diuretica* is prescribed in Brazil as a diuretic; but is supposed to act rather as an emollient. The dried leaves of another species, *S. purpurifolia*, are applied in Brazil to the punctures of wasps. And finally, to omit a great quantity of plants having similar qualities, it is sufficient to name the *Abelmoschus esculentus*, whose fruit, called Ochro, Gombo, Gobbo, Bandikai, &c., is a necessary ingredient in soup, to which it imparts its mucilaginous quality. The wood is very light, and of little value. Root-sticks are cleared from the soft mucilaginous stems of *Sida mianantha*. The bark is often so tender as to be transformed into cordage. *Malva crispa* was found by Cavendish to be fit for the purpose, and several species of *Hibiscus* are employed in like manner in tropical countries. Even the fibres of the bark of *Hibiscus arboreus* the whips were manufactured with which the negro slaves were lashed in the West India Islands; the plant is called *Mulwa* or *Mulwa*. *Sida alutida* is said to be cultivated in China, as a linen. *Hibiscus scaberrimus* or *hirsutus* is in India, as a substitute for hemp. The bark of this plant is called *Walla*; a resinous kind of oil is expressed from the seeds. Various other species are found in the serviceable fibres. The petals of some are aromatic; this property occurs in *Malva Alea* and in *Hibiscus Rosa sinensis*, of which the Chinese use the petals to make eyebrows and the leather of their shoes. The leaves of *Althæa rosea* are said to yield a blue colouring matter not inferior to indigo. A decoction of the root and stem of *Urena lobata* is employed in Brazil as a remedy in venereal cases; the flowers are used as an expectorant in dry and inveterate coughs. The herb has been good medicine. A few species, such as *Hibiscus Salsola*, and *Abelmoschus*, are highly medicated. The musky seeds of *Abelmoschus moschatus* are considered useful and necessary, and by the Arabians are mixed with oil, or, in the West India, these seeds, called *Gombo musqué*, reduced to powder, and steeped in rum, are supposed to be a potent remedy against serpent bites. The root of *Sida mianantha* is extremely bitter, and is considered



a valuable stomachic. The Cotton of commerce is the hairy covering of the seeds of several species of *Gossypium*. For an excellent account of this plant, and the various species used in commerce, see *Royle's Illustr.* p. 84., and *Wight's Illustr.* The young leaves and seeds of *Gossypium vitifolium* are employed in Brazil in dysentery, and steeped in vinegar are applied to the head in hemicrania.—*Martius*.

Consult Duchartre in *Ann. Sc.* 3 ser. 4. 129, for his observations upon the progressive development and consequent interpretation of the structure of these plants, which he assumes to be dependent upon what is called the process of deduplication; to which I have objected elsewhere (*Elem. of Botany*, par. 413).

The following, with additions, is Dr. Asa Gray's arrangement of the

# GENERA.

Tribe I. MALOPEÆ.	<i>Stewartia</i> , Forsk.	<i>Thornton</i> , Rehb.	<i>Bamia</i> , R. Br.
Malope, <i>L.</i>	<i>Periptera</i> , DC.	<i>Pentameris</i> , E. M.	<i>Hymenocallis</i> , Zenk.
Kitaibelia, <i>W.</i>	<i>Dictyocarpus</i> , Wight.	<i>Typhalea</i> , DC.	<i>Manihot</i> , DC.
Palava, <i>Cav.</i>	<i>Anoda</i> , <i>Cav.</i>	<i>Cancellaria</i> , DC.	<i>Hibiscus</i> , <i>L.</i>
Palavia, Moench.	Lawrencia, <i>Hook.</i>	<i>Pentaspermum</i> , DC.	<i>Kalmia</i> , Adans.
	Fleischeria, <i>Steud.</i>	<i>Colanilla</i> , Comm.	<i>Furcaria</i> , DC.
	Cristaria, <i>Cav.</i>	<i>Malvaviscoides</i> , Endl.	<i>Cremontia</i> , DC.
Tribe II. MALVEÆ.	Gaya, <i>Kth.</i>	<i>Anotea</i> , DC.	<i>Sabbaria</i> , DC.
Althæa, <i>L.</i>	Bastardia, <i>Kth.</i>	<i>Malvaviscus</i> , <i>Dill.</i>	<i>Polychlana</i> , Don.
Althæastrum, DC.	Abutilon, <i>Tourn.</i>	<i>Achania</i> , Swt.	<i>Trionum</i> , Medik.
Ferberia, Scop.	Wissadula, <i>Med.</i>		<i>Bombycella</i> , DC.
Alcea, Linn.	Meliphlea, <i>Zucc.</i>		<i>Paritium</i> , A. Juss.
Lavatera, <i>L.</i>	Sphæralcea, <i>St. Hil.</i>	Tribe IV. HIBISCEÆ.	<i>Azania</i> , Moc. & S.
Azotropa, DC.	<i>Phymosia</i> , Desv.	<i>Gossypium</i> , <i>L.</i>	
Olbia, Medik.	<i>Sphaeroma</i> , Schlecht.	<i>Xylon</i> , <i>Tourn.</i>	
Stegia, Moench.	Modiola, <i>Moench.</i>	<i>Kosteletzkya</i> , <i>Presl.</i>	<i>Sturtia</i> , R. Br.
Savinionia, <i>Webb.</i>	<i>Haynea</i> , Rehb.	<i>Decaschistia</i> , <i>W. &amp; A.</i>	<i>Lagunaria</i> , Don.
Navea, <i>Webb.</i>		<i>Thespesia</i> , <i>Correa.</i>	<i>Lagunea</i> , <i>Cav.</i>
Malva, <i>L.</i>	Tribe III. URENEÆ.	<i>Malvaviscus</i> , <i>Gærtn.</i>	<i>Solandra</i> , <i>Murr.</i>
Anthema, Medik.	Malachra, <i>L.</i>	<i>Serraea</i> , <i>Cav.</i>	<i>Triguera</i> , <i>Cav.</i>
Callirhoe, <i>Nutt.</i>	Urena, <i>L.</i>	<i>Serraea</i> , <i>W.</i>	
Nuttallia, Barton.	Pavonia, <i>Cav.</i>	<i>Serra</i> , DC.	
Napea, Clayton.	<i>Lopimia</i> , Nees.	<i>Dumreichera</i> , <i>Steud.</i>	
Sidalcea, Gray.	<i>Lebretonia</i> , Nees.	<i>Fugosia</i> , <i>Juss.</i>	
Malvastrum, Gray.	<i>Gæthea</i> , Nees.	<i>Cienfuegosia</i> , <i>Cav.</i>	
Sida, <i>L.</i>	<i>Malache</i> , <i>Trew.</i>	<i>Cienfuegia</i> , <i>W.</i>	
Malvinda, Medik.		<i>Redoutea</i> , <i>W.</i>	
		<i>Abelmoschus</i> , Medik.	

NUMBERS. GEN. 39. Sp. 1000.

*Geraniaceæ.*

POSITION.—*Sterculiaceæ.*—MALVACEÆ.—*Byttneriaceæ.*

*Chlervaceæ.*

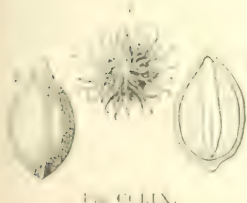


## Osteo. CXXVI. TILLYARD. L. 1894. 1895.

[illegible]

**Diagnosis.** *M. lucifera* has both the structure on the inside of a leg, otherwise rare, and straight wings.

Ferns or shrubs, very seldom herbaceous plants. Leaves large, bipinnate, usually alternate. Flowers axillary, usually perfect. Sepals 4 or 5, distinct or more or less



valvate pistivation. Petals 4 or 5, entire, usually with a little pit at their base, or wanting; most commonly the size of the sepals. Stamens generally 60, hypogynous, distinct, sometimes surrounded at the base by the broad and enlarged border of the stalk of the pistil; anthers 2-celled, dehiscing longitudinally or by pores, the stamens sometimes abortive and petaloid. Ovary simple, composed of from 2 to 10 carpels, which are more or less disunited; style 1; stigmas as many as the carpels; ovules attached to the inner angle, either free or 60, in two rows, each one being attached to the inner angle of two more, and so on, by which the ovules are arranged in

Fruit dry or pulpy, often prickly, sometimes winged, with several cells, or one only by abortion. Seeds solitary or numerous; embryo erect in the axis of thickly attenuated with flat foliaceous cotyledons and a radicle next the hilum.

Although this Order is apparently limited by the character assigned to it in the Diagnosis, yet it includes so many instances of anomalous structure, that some reasonable doubt must be entertained as to its being really so natural an assemblage as it seems to be. The petals are sometimes absent. A genus called *Pygmaeanthus* is remarkable for having a fruit with several spurious cells, and the perianth is the circumference instead of the axis. *Apeiba* has sometimes its calyx as small as the fruit. Brown notices the existence of an African genus of this Order (*Chamaecoma*), the remarkable in having a calyx of 5 lobes, while its corolla consists of 2 small, the fruit composed of 5 single-seeded capsules connected only at the base. The genus *Acrofolia*, sometimes placed near *Homobads* or *Philadelphs*, seems to have been affected with this Order, notwithstanding that its calyx is not valvate, a fact noticed by the author of an Order called *Maquima* by Martius, and *Arctostaphylos* by Kaulfuss. In some respects *Lindendlooms* resemble *Sterculiads*, *Malvaceae*, and the genera allied to them, more especially in the valvate aestivation of their calyx.

The principal part of the Order is found within the tropical alluvial lowlands, forming mean weed-like plants, or shrubs, or trees, with large flowers, usually white or pale flowers. A small number are peculiar to the northern parts of almost every zone, where they form timber-trees.

FIG. CCLVII.—Fruit of *Apocynum androsaemifolium*.—G. R.

Fig. CCLV III - Berrya amurensis - II fruit. 1 - a flower; 2 - the pericarp and the ovary; 3 - a transverse section of the ovary; 4 - a perpendicular section of it; 5 - a section of the seed.

Fig. 6011X.—*Trimmifetta cordata*. 1, a fruit



They have all a mucilaginous, wholesome juice. The leaves of *Corchorus olitorius* are used in Egypt as a pot-herb. The berries of some of them are succulent and eatable. The species are most remarkable for the toughness of the fibres of their inner bark, which are used for various economical purposes. Fishing lines and nets, rice bags or gunny, and a coarse kind of linen called tat, are made in India of *Corchorus capsularis*; and the Russian mats of commerce are manufactured from the *Tilia*. The bark of *Luhea grandiflora* is used in Brazil for tanning leather. The wood of *Luhea divaricata*, which is white and light, but very close grained, makes good basket-stocks, and wooden soles for shoes; the Brazilians call all such *Açoita cavallos*, because the sticks they use for driving their cattle are obtained from them. The flowers of *Tilia*, separated from the bracts, are used in infusion, according to Host, with much success in vertigo and spasms; they promote perspiration and alleviate coughs; but if the bracts and fruits are mixed with the flowers, the infusion then becomes astringent, and confines the bowels. Some species of *Grewia*, as *G. sapida*, *asiatica*, &c., bear pleasant acid berries, much used in the manufacture of sherbet. The wood of *Grewia elastica*, called *Dhannoo*, affords timber highly valued for its strength and elasticity, and therefore much used for bows, the shafts of carriages, &c. The excellent light timber called *Trincomalee* wood, employed in the construction of the *Massoola* boats of Madras, is furnished by *Berrya Ammonilla*. The berries of *Aristotelia Maqui* are eatable, and made into wine; the tough bark makes the strings, and the wood the sides of musical instruments.

The leaves of *Vallea cordifolia* are used for dyeing yellow. The furrowed, sculptured, bony fruit of the *Elæocarps*, being freed from its pulp, forms handsome necklaces, which are not uncommonly set in gold, and sold in the shops. The name *Julpai*, or *Olive*, is applied to the fruit of some species of *Elæocarp*, which is eaten; while that of others is dried and used in the curries of the natives of India, and is also pickled. Roxburgh did not succeed in extracting any oil from the fruit. Dr. Horsfield says that the bark of one of the Java *Elæocarps* is bitter and used as an anthelmintic.

The mucilaginous, and at the same time astringent, properties of the leaves and fruit of certain *Triumfettas*, called *Carapixo da Calçada* in Brazil, which grow everywhere in that country, especially on the road-side and in the vicinity of dwellings, render them serviceable in injections for inveterate gonorrhœas.

#### GENERA.

I. TILIÆ.—Corolla 0, or the petals entire. Anthers opening longitudinally.

##### SLOANIDÆ.

*Jusseltia*, H. B. K.  
*Ablania*, Aubl.  
*Trichocarpus*, Schreb.  
*Dasynema*, Schott.  
*Adenobasium*, Presl.  
*Myriocheila*, DC.  
*Favolaria*, DC.  
*Sloanea*, Linn.  
*Sloana*, Plum.  
*Gynostoma*, DC.  
*Oxyandra*, DC.

##### GREWIDÆ.

*Vantanea*, Aubl.  
*Lemniscia*, Schreb.  
*Apeiba*, Aubl.  
*Aubletia*, Schreb.  
*Luhea*, Willd.

*Brotera*, Flor. Flum.  
*Allegria*, Moc. et Sess.  
*Mollia*, Mart. et Zucc.  
*Schlechtendalia*, Sprng.  
*Heliocarpus*, Linn.  
*Montia*, Houtt.  
*Entelea*, R. Br.  
*Sparmannia*, Thunb.  
*Clappertonia*, Meisn.  
*Honkenia*, Willd.  
*Corchoropsis*, Sieb. et Zucc.  
*Corchorus*, Linn.  
*Antichorus*, Linn. f.  
*Caricteria*, Scop.  
*Coreia*, P. Br.  
*Mærlensia*, DC.  
*Ganja*, Rumph.  
*Triumfetta*, Plum.  
*Lappula*, DC.  
*Bartramia*, Gärtn.  
*? Perpa*, Blum.  
*Tilia*, Linn.  
*Lindnera*, Reichenb.  
*Browlowia*, Roxb.

*Humera*, Roxb.  
*Christiana*, DC.  
*Grewia*, Juss.  
*Nhemia*, Endl.  
*Mallocoeca*, Forst.  
*Chadara*, Forsk.  
*Siphomeris*, Boj.  
*Microros*, Linn.  
*Arsis*, Lour.  
*Damine*, Endl.  
*Vincetia*, Boj.  
*Belotia*, A. Rich.  
*Diplophractum*, Desf.  
*Columbia*, Pers.  
*Colona*, Cav.  
*Berrya*, Roxb.  
*Espera*, Willd.  
*Muntingia*, Linn.  
*Calabura*, Plukn.  
*Trilix*, Linn.  
*Jacquinia*, Mut.  
*Bancroftia*, Macfad.  
*Aristotelia*, Herit.

II. ELÆOCARPEÆ.—Petals lacerated. Anthers opening by a transverse valve at the apex.

*Elæocarpus*, Linn.  
*? Adenodus*, Lour.  
*Lochneria*, Scop.  
*Ganitrus*, Gärtn.  
*? Craspedum*, Lour.  
*Monocera*, Jack.  
*Diceras*, Endl.  
*Dicera*, Forst.  
*Beythea*, Endl.  
*Friesia*, DC.  
*Aceronodia*, Blum.  
*Acrozus*, Spreng.  
*Vallea*, Mut.  
*Tricuspidaria*, R. et Pav.  
*Tricuspis*, Pers.  
*Crinodendron*, Molin.

NUMBERS. GEN. 35. Sp. 350.

POSITION.—Malvaceæ.—TILIACEÆ.—  
*Tremandrucæ.*

#### ADDITIONAL GENERA.

*Glyphæa*, Hook. f. near *Grewia*.  
*Omphacarpus*, Kthls.  
*Anstrutheria*, Gardner, near *Friesia*.

The textile material called *Jute*, from which gunny (or rice) bags are manufactured, is the fibre of *Corchorus capsularis*.



## ALLIANCE XXIX. SAPINDALES.—THE SAPINDAL ALLIANCE.

DIAGNOSIS. *Hypogynous Euponia, with monothalamous unsymmetrical flowers, with paracarpous, an imbricated calyx and corolla, definite stamens, and limb or an abscissa.*

In every Order, comprehended under this Alliance, the flowers are more or less unsymmetrical, and in several of them such irregularity occurs in more than one series of the floral organs. Thus, the Foreworts, which are among the most symmetrical, are pentamerous except the ovary, which consists of 2 carpels, Thalicterines have similar proportions, while Malpighiads and Erythroxyls combine a 3-merous ovary with a 5-merous flower.

The Orders seem to be all bound up in close relationship, with the exception of Vochysiads, which are but little known and whose true station is therefore doubtful. Petiveriads, though generally disunited from Sapindals by a long interval, can hardly be regarded as anything more than an apetalous, very simple form of Soapworts.

The passage into Guttiferales is not through Erythroxyls, which stand last in the following series, but through Soapworts, which are extremely near the Guttiferal Rhizobels.

## NATURAL ORDERS OF SAPINDALES.

<i>Flowers complete, partially symmetrical. Calyx imbricate.</i> <i>Anthers 2-4-celled, opening by pores . . . . .</i>	122. TREMANTRACEÆ
<i>Flowers complete (irregular), unsymmetrical. Petals naked.</i> <i>Anthers 1-celled, opening by pores. Seeds circunculate . . . . .</i>	123. POLYDALACEÆ
<i>Flowers complete, unsymmetrical, very irregular. Petals</i> <i>naked. Anthers opening longitudinally. Carpels 3. Seeds</i> <i>capitate. (In one case the ovary is adherent) . . . . .</i>	124. VOCHYSIACEÆ
<i>Flowers complete, partially symmetrical. Calyx imbricate.</i> <i>Ovules ascending. Stamens simple. Leaves opposite, with</i> <i>stipules . . . . .</i>	125. STAPHYLEACEÆ
<i>Flowers complete, unsymmetrical. Petals usually with an</i> <i>appendage or 0. Anthers opening longitudinally. Car-</i> <i>pels 3. Seeds usually urdiate, wingless. . . . .</i>	126. SAPINDACEÆ
<i>Flowers apetalous. Carpel solitary . . . . .</i>	127. PENTHEDACEÆ
<i>Flowers complete, unsymmetrical. Petals naked or 0. An-</i> <i>thers opening longitudinally. Carpels 2. Seeds pitted</i> <i>on an aril . . . . .</i>	128. APTERACEÆ
<i>Flowers complete, partially symmetrical. Calyx imbricate.</i> <i>Petals naked, stalked. Ovules bearing by axils. Stamens</i> <i>simple. Embryo usually exsertate . . . . .</i>	129. MALPIGHIACEÆ
<i>Flowers complete, partially symmetrical. Calyx imbricate.</i> <i>Petals with an appendage. Ovules sessile, pendulous.</i> <i>Stamens capitate. Embryo straight . . . . .</i>	130. ERYTHROXYLACEÆ



## ORDER CXXXII. TREMANDRACEÆ.—POREWORTS.

Tremadraceæ, *R. Brown in Flinders*, p. 12. (1814); *DC. Prodr.* 1. 343. (1824); *Endl. Gen.* cxxxii.

DIAGNOSIS.—*Sapindal Exogens*, with partially complete symmetrical flowers, a valvate calyx, and 2-4-celled anthers opening by pores.

Slender heath-like shrubs, with their hairs usually glandular. Leaves alternate or whorled, without stipules, entire or toothed. Pedicels solitary, axillary, 1-flowered. Flowers often large and showy. Sepals 4 or 5, equal, with a valvate æstivation, slightly cohering at the base, and deciduous. Petals equal in number to the sepals, with an involute æstivation, wrapping up the stamens in pairs, much larger than the calyx, and deciduous. Stamens hypogynous, distinct, 2 before each petal, and therefore either 8 or 10; anthers 2- or 4-celled, opening by a pore at the apex. Ovary 2-celled; ovules from 1 to 3 in each cell, anatropal, with a hooked apex, pendulous; styles 1 or 2. Fruit capsular, 2-celled, 2-valved; dehiscence loculicidal. Seeds pendulous, ovate, with a hooked appendage at the apex, but with none about the hilum; embryo cylindrical, straight, in the axis of fleshy albumen, and about half as long, the radicle next the hilum.

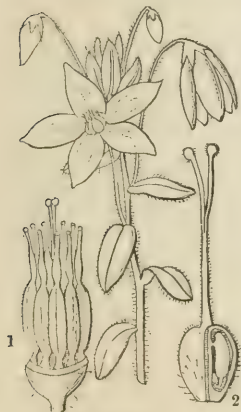


Fig CCLX.

There is little to divide these plants from Milkworts, except their regular symmetrical flowers, and valvate calyx. They want the caruncula of that Order, in room of which they have the chalazal end of the seed extended into a hooked process. Their stamens being opposite the petals in pairs may, taken with the valvate calyx, be regarded as an indication of some tendency towards Rhamnads, and the general condition of their flower is much like that of Pittosporads, except in the great development of the embryo.

All are natives of New Holland.

Their properties are unknown.

De Candolle placed them between Milkworts and Pittosporads, Meisner between Frankeniads and Milkworts, Endlicher in his Polygalinæ consisting of Poreworts and Milkworts only, and Adolphe Brongniart takes the same view of their affinity.

#### GENERA.

*Tetratheca*, Sm.

*Tremandra*, R. Br.

*Platythea*, Steetz.

NUMBERS. GEN. 3. Sp. 16.

*Tiliaceæ.*

POSITION. ——— TREMANDRACEÆ.—Polygalaceæ.

*Pittosporaceæ.*

Fig. CCLX.—*Tetratheca hirsuta*. 1. the stamens; 2. the pistil, with one of the cells laid open.



## ORDER CXXXIII. POLYGALACEÆ. MIEROWICZ.

*Polygalact.*, *Juss. Ann. Mus.* 14: 386 (1806). *R. Brown ex. Linnæus*, *Juss. Mem. Mus.* 1: 366. *Juss. (Puff.)* 1: 361. *Aug. de St. Hilaire and Moench*, *Expos. Mus. Mus.* 11: 346. *Winkl. & Cass.* 1: 40. *Engelm. Gen. exsicc.* 1: 114. *Richardson, Martine, Ind. p. 55*. *Trinovius, Martine* 1: 247. *Engelm. Gen. p. 189*. *Montagne, Ind. Ind. p. 30*. *S. Gussone, Ind. p. 30*.

**DIAGNOSIS.**—*Sapindal* Fraxinæ, with complete Gynæceum, trilocular fruit, naked petals, 1 celled at their opening by pores, and exserted seeds.

Shrubs or herbaceous plants, sometimes twiners. Leaves generally alternate, sometimes opposite, mostly simple, and always destitute of stipules. Flowers usually racemose, often small and inconspicuous, but showy in many species of *Polygala*.



FIG. CCLXI.

Pedicels with 3 bracts. Sepals 5, very irregular, distinct, often glumaceous, 1 exterior, of which 1 is superior and 2 anterior (the wings) usually petaloid, and alternate with the upper and lower ones. Petals hypogynous, usually 5, of which 1 is anterior and larger than the rest (the keel), and 2 alternate with the upper outer, and lateral inner sepals, and often connate with the keel; sometimes 6, and then the 2 additional ones minute and between the wings and the lower sepals. Keel sometimes entire, and then either naked or crested; sometimes 3-lobed, and then destitute of a crest. Stamens hypogynous, 8 usually combined in a tube, unequal, and ascending; sometimes 4, and distinct; the tube split opposite the upper sepal; anthers clavate, imbricate, mostly 1-celled and opening at their apex, sometimes 2-celled.

Disk either absent or present, regular or irregular. Ovary superior, compressed, with 2 or 3 cells, which are anterior and posterior, the upper one occasionally suppressed; ovules solitary, very rarely twin, pendulous, anatropal; style simple, curved, sometimes very oblique and cucullate at the apex, which is also entire or lobed, stigma simple. Fruit usually opening through the valves; sometimes indehiscent, membranous, fleshy, coriaceous, or drupeous, winged, or apically. Seeds pendulous, with a caruncula next the hilum, naked or covered with hairs, the outer integument crustaceous, the inner membranous; albumen abundant, fleshy, rarely reduced to a thin gelatinous plate; embryo straight, or slightly curved, with the radicle next the hilum.

The structure of this Order has been explained by Aug. de St. Hilaire and Moench-Tandon, from whose Memoir, above quoted, the foregoing characters are extracted.

FIG. CCLXI.—*Polygala erythraea*. 1, an entire flower seen from the side; 2, the disk not opened to exhibit the stamens; 3, the pistil; 4, a section of a ripe seed, in the middle of the embryo; 5, the apex, which represents the real base, is seen a caruncula.

FIG. CCLXII.—Antlers of *Polygala vulgaris*, expanded.



Milkworts are remarkable, among other things, for the irregularity of their flowers, which is such as to obscure, in a great measure, the relative position of the sepals and petals. The calyx apparently consists of but three pieces, which are usually green, and like sepals in their common state; but their real number is 5, the two coloured lateral petal-like bodies sometimes lying within the apparent sepals, being in reality part of the series of the calyx. The corolla is mostly monopetalous, and, if carefully examined, formed of 3 pieces; namely, the keel and two petals, all blended together. We have, therefore, an abortion of two petals, according to the laws of alternation. But this is not all; there is not only an abortion of two petals, but of those two which would, if present, be found right and left of the keel. The monopetalous corolla is, therefore, formed by the cohesion of the two posterior and the anterior petal of a pentapetalous corolla, of which the two lateral petals are suppressed. The keel has an appendage of an anomalous character, called technically a crest, and often consisting of one or even two rows of fringes or divisions, originating not from the margin, but from within it, and sometimes cohering in a common membrane at their base. Aug. de St. Hilaire has shown that this crest is nothing more than the deeply-lobed middle segment of a keel, with these lobes in such a state of cohesion that the central lobe is pushed outwards, while the lateral ones cohere by their own margins and with its back. The stamens are only 8: two therefore are suppressed. This relative position of the fifth sepal and petal respectively, was first indicated by Brown.

Milkworts are stationed by De Candolle between Sundews and Poreworts (Tremandraceæ), and in the immediate vicinity of Violetworts. With the latter they were thought to be related on account of their hypogynous stamens, irregular flowers, and cucullate stigma; and with Poreworts on account of the caruncula of their seed. To Fumeworts they approach in the general aspect of their flowers, and in little more. Leguminous plants are, notwithstanding their perigynous stamens, an Order with which Milkworts seem at first sight to have some affinity; the irregularity of corolla is of a similar nature in both; there is in Leguminous plants a tendency to suppress the upper lateral petals in *Erythrina*, as in *Polygala*, and the ascending direction of the style with a cohesion of stamens are characters common to both Orders. Many additional observations are made to the same effect by St. Hilaire and Moquin-Tandon, who, moreover, compare the Order with Rueworts; but those authors appear to have finally decided upon the true position of Milkworts being in the vicinity of Soapworts; remarking that "the calyx of the latter is unequal, the corolla very irregular, and the ovary of *Schmidelia* usually 2-celled and 2-seeded, like that of *Polygala*. Moreover, a great part of the genera of that Order have, with a calyx of five divisions, a corolla with four petals, and the place of the fifth is manifestly vacant. This suppression is not exactly the same as what is observed in the corolla of *Polygala*, where there are only 3 petals with 5 sepals; but the suppression has more analogy with what concerns the stamens, since with a quinary number in the calyx each Order has eight antheriferous filaments." In this

view I fully agree. The unsymmetrical flowers, more especially manifested in the reduction of the number of carpels to 2 or 3 in a structure otherwise quinary, the definite ovules, the twining habit of *Comesperma*, the samaroid fruit of *Securidaca*, and it may even be added, the deleterious qualities of some *Polygalas*, together with the saponaceous secretions of the *Monninas*, are all arguments of the strongest kind in favour of Milkworts and Soapworts belonging to the same Alliance.

Certain anomalous genera, belonging as I think to this Order, have been elevated to the rank of Natural Orders. Of these *Trigonia*, a genus of tropical American trees, has been divided from Milkworts because of its leaves being opposite and having sti-



Fig. CCLXIII.

Fig. CCLXIII.—*Trigonia crotonoides*.—A. de St. Hilaire. 1. a flower seen from the side; 2. the corolla, with the petals displayed in their natural position; 3. a pistil; 4. cross section of the ovary; 5. cross section of a seed.



pales, of some supposed difference in the relative position of the largest petal, the anthers opening longitudinally, and the presence of some fleshy glands between the ovary and stamens; I cannot, however, concede anything like ordinal separation in these circumstances. *Trigonía* may be regarded either as an approach on the part of Milkworts to the Sapindaceous structure, as is indicated by the longitudinal dehiscence of its anthers, the greater symmetry of its flowers, and its 3-valved fruit; or as actually a member of the Soapworts, approaching Milkworts. The supposed relation between it and Spindle trees or Leguminous plants, which M. Cambessèdes suggests, appears to be a very slight indication of analogy.—*Nat. Fl. Braz. Mer. v. 2. p. 112.*

*Krameria* has much higher claims to separation. The whorls of its flowers are so completely dislocated that it is difficult to determine the relative position of the parts; there is no trace of the quasipapilionaceous structure generally characteristic of Milkworts, its ovary is imperfectly 2-celled, and it is said that no albumen exists in its seeds. Certainly these are points of moment. Nevertheless, its definite hypogynous stamens, porous anthers, unsymmetrical flowers, definite pendulous ovules, bur-like fruit, which resembles that of *Salomonina*, and in some degree its habit, are conformable to the Milkwort-structure; and in the absence of all trace of the existence of other genera approaching this kind of organisation, it seems expedient to regard it as a mere exception to the usual structure of an Order whose general condition is in many respects very anomalous. It, too, may be regarded as assisting to bring into contact the Milkworts and Soapworts, for *Krameria cytisoides* has ternate leaves.

*Soulamea* is another instance of the elevation of a solitary genus into a Natural Order. This is a Molucca plant, also without albumen in its seeds, and having a regular trimerous flower with 2-celled anthers. It may perhaps be considered as an instance of the usual irregular flower of Milkworts assuming a regular type.

Lastly, of the genus *Moutabea*, promoted by Endlicher, who stations it near Soapworts, regarding it as monopetalous, it may be said with tolerable confidence that it has not a single feature that can justify its separation from Milkworts. Like *Nandophyllum* its petals are equal-sized, and as for their adhesion into a tube, that is no more than what occurs in all the Polygalas, whose stamens hold together parts which under ordinary circumstances are distinct. So entirely, indeed, does *Moutabea* agree with *Polygala*, that it even has its eight 1-celled anthers opening at the point, in combination with a 2-lobed corolla. The berries of *Moutabea longifolia* are said to be eatable; so are those of *Mundia spinosa*. A tubular calyx exists in *Moutabea*, but that will hardly be named upon as a ground for forming it into a Natural Order.

Most of the genera are limited to one or two of the five parts of the globe; thus *Salomonina* is only found in Asia, *Soulamea* in the Moluccas, *Muraltia* at the Cape of Good Hope, and *Momina* and *Badiera* in South America. *Conosperma* is found both in Brazil and New Holland, and, what is very remarkable, there is in the former country a species of the Cape genus *Mundia*. *Polygala* itself occurs in part of the two parts, under the torrid zone and in temperate climates, at Cayenne, and on the mountains of Switzerland; it is, however, very unequally distributed. This genus inhabits almost every description of station—dry plains, deep morasses, woods, mountains, cultivated and barren soils. *Conosperma* is only known in Brazil and Australia. *Momina* and *Krameria* inhabit open places in the temperate parts of South America.

Milkworts offer, as has been stated, considerable diversities of structure, and therefore, as might have been anticipated, the purposes to which they are applicable are by no means uniform. The greater part are bitter, and in their roots milky. In this category may be referred the following cases. *Polygala amara* is a European perennial, all the parts of which are extremely bitter; it is much extolled in pulmonary complaints and spitting of blood. *P. vulgaris* and major have similar uses, but are inferior in energy. A strong bitter taste pervades all the parts of *Polygala ruficornis*, a North American



FIG. CCLXIV.

Fig. CCLXIV. *Krameria cistoides*.—H. & A. 1. an expanded flower; 2. a pistil, showing the relative position of the parts; 3. a stamen; 4. a perpendicular section of an ovary.



species; in small doses its infusion is found useful as a tonic and stimulant to the digestive organs; in large doses it opens the body and excites diaphoresis. In a Molucca plant, the *Soulemea amara*, called by Rumphius *Rex amaroris*, all the parts, especially the roots and fruit, have an intense bitterness (horrenda amarities *Rumf.*). They are employed in the Malayan Archipelago with extraordinary success in cholera and pleurisy, and are regarded as being most valuable as a febrifuge.

Others are distinguished for their emetic, purgative, and diuretic action. Of these the most celebrated is a North American herb called Snake-root, *Polygala senega*; of this plant the root is somewhat acid and acrid. It acts as a sudorific and expectorant in small doses, and as an emetic and cathartic in large ones. It is employed in pneumonia, asthma, croup, dropsy, chronic rheumatism, and especially in such uterine complaints as amenorrhœa. Dr. Archer has extravagantly praised it in cynanche trachealis. Chemists refer the action to the presence of a peculiar principle called Polygaline or Senegine. *P. sanguinea* and *purpurea* in North America, *Chamæbuxus* in Europe, *P. paniculata*, a very common West Indian annual, *P. serpentaria* of the Cape, *P. crotalariae* in the Himalayas, all appear to participate in these qualities, and it is not a little remarkable that the whole of these plants have the reputation of being antidotes to snake bites; the oppression of breathing observable in such cases appears to be certainly relieved by them. Some are mere emetics; such as *P. poaya*, used successfully in Brazil in bilious fevers, and *P. glandulosa* and *scoparia*, Mexican species. *P. thesioides*, called Chinchin in Chili, is said to have a powerfully diuretic root. *Badiera diversifolia*, a little West Indian bush, is said to rival *Guaiacum* in its peculiar qualities. Finally, these principles become so concentrated in *P. venenosa*, called *Katu-tutun* in Java, as to render that plant a poison; it is dreaded by the natives, who say that its heavy noxious odour, or even the touch, produces violent sneezing and severe headache.

Among plants whose uses are not reducible to either of the foregoing heads may be mentioned the following. The drupes of *Mundia spinosa*, a Cape shrub, are eatable. The bark of the root of *Monnina polystachya* and *salicifolia*, when fresh, pounded and moulded into balls, or their dry bark, is detergent; it readily froths when agitated in water, and is used by the Peruvians as a substitute for soap; the ladies of Peru ascribe the beauty of their hair to the use of its infusion, and the silversmiths of Huanuco employ it for cleansing and polishing wrought silver. It is also used with great success in the cure of dysenteries and irritating diarrhoeas in Peru, where it is preferred to *Quassia*. This saponaceous quality is, among other things, an indication of the relation borne by Milkworts to Soapworts (*Sapindacæ*). *P. tinctoria* is used by the dyers in Arabia. The wood of *Xanthophyllum*, a genus of trees of considerable size, is said to be valuable. The *Kramerias*, anomalous plants inhabiting the temperate parts of South America, and called Rhatany-roots, are intensely astringent. The infusion of their roots is blood-red, and is employed to adulterate Port wine; in Peru, an extract is formed from *K. triandra*, which is a mild, easily assimilated, astringent medicine, possessed of great power in passive bloody or mucous discharges; and also in weakness of the digestive organs, muscular debility, and even in intermittent and putrid fevers. The powder forms, along with charcoal, an excellent tooth powder; and an infusion is used as a gargle and wash. Such other species as have been examined seem to be identical in their nature.

#### GENERA.

*Salomonina*, Lour.  
*Polygala*, Linn.  
*Psychanthus*, Raf.  
*Elepharidium*, DC.  
*Clinclinia*, Feuill.  
*Timutua*, DC.  
*Senega*, DC.  
*Chamæbuxus*, Dill.  
*Triclisperma*, Raf.  
*Brachytropis*, DC.

*Badiera*, DC.  
*Penœa*, Plum.  
*Comesperma*, Labill.  
*Catocoma*, Bth.  
*Muraltia*, Neck.  
*Heisteria*, Berg.  
*Mundia*, Kunth.  
*Nylandtia*, Dumort.  
*Vascoa*, DC.

*Monnina*, Ruiz et Pav.  
*Hebeandra*, Bonpl.  
*Carpolobia*, G. Don.  
*Lophostylis*, Hochst.  
*Securidaca*, Linn.  
*Krameria*, Löffl.  
*Xanthophyllum*, Roxb.  
*Jackia*, Blum.  
*Soulemea*, Lam.

*Cardiocarpus*, Reinw.  
*Trigonina*, Aubl.  
*Mainea*, Fl. Flum.  
*Moutabea*, Aubl.  
*Cryptostomum*, Schreb.  
*Acosta*, Ruiz et Pav.  
? *Bredemeyera*, Willd.  
? *Hymenanthera*, R. Br.

NUMBERS. GEN. 19. Sp. 495.

POSITION.—*Tremandracæ*.—*POLYGALACEÆ*.—*Sapindacæ*.  
*Violacæ*?

For the progressive development of this order, consult Payer in *Ann. Sc. 3 ser. XV.* 346. Braun refers *Krameria* to *Leguminosæ*. See *Plant. Lindheim*, p. 4. Dr. Asa Gray, without absolutely assenting, is of opinion that at all events it does not belong here. *Gen. N. Am. Plants*, II. 227.

#### ADDITIONAL GENERA.

*Lophostylis*, Hochst. near *Securidaca*.  
*Cardiophora*, Benth. = *Soulemea*.

? *Purdiea*, Planchon.



## ORDER CXXXIV. VOCHYACEÆ. VOCHYACEÆ.

*Vochysia* Muhl. *Nat. tree* 1: 129 (1824); *Fl.-fr.* 106, 107, 108; *Muscul.* 114. *Vochysia* A. DC. *Mon. Musc.* 6: 293. (1825); *luc. Florul.* 3: 25 (1828).

DIAGNOSIS.—*Stipitoid Element, with complete, unguiculate, very imbricate flowers, imbricated petals, anthers opening longitudinally, 5-merous, and imbricate seeds.*

Trees or shrubs. Branches opposite, when young 4-angled. Leaves opposite, sometimes towards the extremities of the branches alternate, entire, with glands or stipules at the base. Flowers usually in terminal panicles or racemes. Sepals 4-5, the two outer the smallest, the two in front the largest, imbricated in aestivation, the upper one much the largest and spurred. Petals 1, 2, 3 or 5, alternate with the segments of the calyx, and inserted into their base, unequal. Stamens 1-5, usually opposite the petals, rarely alternate with them, arising from the bottom of the calyx, for the most part sterile, 1 of them having an ovate fertile 4-celled anther. Ovary free, or partially adherent, 3-celled; ovules in each cell, solitary or twin, or 00, attached to the axis, amphitropal, with the foramen uppermost; occasionally 4-celled, with 2 anatropal ovules rising from the base; style and stigma 1. Capsule 3-cornered, 3-celled, 3-valved, the valves bursting along their middle, with a central columella; occasionally indehiscent, 1-celled, 1-seeded, and crowned by the sepals grown out into wings. Seed without albumen, erect, usually winged; embryo straight in the capsular genera, with large leafy cotyledons and a short superior radicle; in the monospermous fruit, orthotropal, cylindrical, with semi-cylindrical cotyledons, and a short inferior radicle.

Such is the character that Botanists give to a most curious race of trees and shrubs, which few have had the opportunity of studying, but which are remarkable for the beauty of their large and gaily coloured flowers. It seems, however, certain that the Order, as thus described, contains genera which must hereafter be separated, and that it cannot be at present regarded as being in all well limited. De Candolle speaks of it as being in habit and flower somewhat allied to Guttifers or Margraviads, but distinct from both in the stamens being inserted into the calyx; perhaps more directly connected with Myrcinæ, on account of the cartilagineous cotyledons and inverted seeds; and even perhaps allied to the *Chrysophyllæ*, on account of the abortive solitary stamen. To me it still appears to be most allied to *Sideroxylon*, an affinity strongly pointed out by the irregular flowers, 4-celled ovary, and imbricate, but also to be yet nearer Milkwoorts, from which the calycine flowers and ascending pedicel principally distinguish it. The main difficulty in associating it with any 2 flowers is, whilst these Orders belong, consists in the stamens being truly polygamous. But there is no perigynous Alliance to which it seems referable, and the peculiar proportion of the 3-celled ovary to the 5-parted calyx and corolla, strongly indicates the true affinity to be with the Sapindal Alliance.

Natives of equinoctial America, where they inhabit arid forests, by the banks of streams, sometimes rising up mountains to a considerable elevation. They are often trees with large spreading heads.



FIG. CCLXV.

FIG. CCLXV.—*Solanum corallipes*—8. *Muscul.* 5: unguiculate flower; 2 a pistil; 3 a stamen; 4 a transverse section of the ovary.



Little is known of any use to which they can be applied. Their flowers are reputed to be very sweet, and some are said to have a resinous juice. The Itaballi, or Copai yé wood of Guiana, a hard but not very durable timber, is obtained from *Vochya guianensis*, according to Schomburgk.

GENERA.

<i>Callisthene</i> , Mart. et Zuc.	<i>Schüchia</i> , Endl.	<i>Salmonia</i> , Neck.	? <i>Erisma</i> , Rudge.
<i>Callisthenia</i> , Spreng.	<i>Vochysia</i> , Juss.	<i>Cucullaria</i> , Schreb.	<i>Debræa</i> , Röm. et Schl.
<i>Amphilochia</i> , Mart.	<i>Vochy</i> , Aubl.	<i>Struckeria</i> , Fl. Fl.	<i>Dittmaria</i> , Spreng.
<i>Aqardhia</i> , Spreng.	<i>Vochya</i> , Vandell.	<i>Salvertia</i> , St. Hil.	? <i>Lozania</i> , Seb. Mut.
<i>Qualea</i> , Aubl.			

NUMBERS. GEN. 8. Sp. 51.

*Violaceæ.*

POSITION.—*Polygalaceæ.*—*VOCHYACEÆ.*—*Sapindaceæ.*



## ORDER CXXXV. STAPHYLEACEÆ.—Bladders-Nuts.

Colatrines, § Staphyleaceæ, DC. *Prodr.* 2. 2. 1825. — Staphyleaceæ, *Endl.* *Bot. p. 452*, 76. 1825.  
*Endl. Gen. CXXXV.*

DIAGNOSIS.—*Sapindal Euphorb.*, with partially complete, symmetrical flowers, or tubular calyx, ascending ovules, simple stigma, opposite leaves, with stipules.

SUBULS. Leaves opposite (rarely alternate), pinnate, with both common and partial



FIG. CCLXVI.

deciduous stipules. Flowers in terminal, stalked racemes, sometimes  $\frac{1}{2}$  -  $\frac{3}{4}$  -  $\frac{5}{6}$ . Sepals 5, connected at the base, coloured, with an imbricated aestivation. Petals 5, alternate, with an imbricated aestivation, inserted in or around a free crenated saucer-shaped disk. Stamens 5, alternate with the petals, perigynous. Ovary 2- or 3-celled, free, with the carpels more or less distinct; ovules several, horizontal or ascending, anatropal; styles 2 or 3, cohering at the base. Fruit membranaceous or fleshy, indehiscent or opening internally, often deformed by the absorption of some of the parts. Seeds ascending, roundish, with a long testa; hilum large, truncate; albumen little or none; cotyledons thick; radicle short, next the hilum.

Combined with Spindles-trees by De Candolle, but distinguished by Ad. Brongniart (*Mém. sur les Rhamnéac.*, p. 16), this Order appears to be essentially characterised by its opposite pinnated stipulate leaves, and to be the more closely allied to Soapworts, from

which it is distinguished by the number of its sepals, petals, and stamens being alike.

The very few species which belong here are irregularly scattered over the face of the globe. Of the genus *Staphylea*, 1 is found in Europe, 1 in North America, 1 in Japan, 2 in Jamaica, 1 in Peru; and of *Turpinia*, 1 is Mexican, and 1 East Indian.

Very little is known of their uses. The Bladders-nuts are handsome trees of small size; their seeds are oily, rather austere, and slightly purgative. The inner bark of the root of *Euscaphis staphyleoides*, a Japan plant, is bitter and astringent, and is used in dysentery and chronic diarrhoea, according to Siebold.

## GENERA.

<i>Turpinia</i> , Forst.	<i>STAPHYLEA</i> , Linn.	
<i>Podocarpus</i> , Reck.		<i>Staphylea</i> , Tournef.
<i>Euscaphis</i> , Sieb. et Zucc.		<i>Amelanchier</i> , Thunb.

NUMBERS. GEN. 3. Sp. 11.

POSITION. — STAPHYLEACEÆ.—Sapindaceæ.  
*Colatrines.*

FIG. CCLXVI. *Staphylea trifolia*—*Delav.* 1. A branch with leaves and a terminal raceme of flowers. 2. A flower. 3. A longitudinal section of its ovary.



## ORDER CXXXVI. SAPINDACEÆ.—SOAPWORTS.

*Sapindi*, Juss. Gen. 246. (1789).—Sapindaceæ, Juss. Ann. Mus. 18. 476. (1811); DC. Prodr. 1. 601. (1824); Cambessèdes in Mém. Mus. 18. 1. (1829); Endl. Gen. cexxx.; Wight Illustr. 1. p. 141.—Asculaceæ, Ed. pr. lxii.—Hippocastaneæ, DC. Théorie, Ed. 2. 244. (1819); Prodr. 1. 597. (1824); Endl. Gen. p. 1075.—Castaneaceæ, Link Enum. 1. 354. (1821).—Millingtoniæ, Jack in Malay. Misc. 2. 32; Hooker Journal, 377.—Millingtoniaceæ, Wight and Arnott in Ed. Ph. Journ. 15. 177. (1833); Prodr. Penins. 115. (1834); Royle Illustr. p. 139. (1835); Wight Illustr. 1. t. 53.—Meliosmeæ, Endl. Gen. p. 1074.

DIAGNOSIS.—*Sapindal Exogens*, with complete, unsymmetrical flowers, petals usually with an appendage, anthers opening longitudinally, 3 carpels, and usually arillate, wingless seeds.

These are for the most part trees of considerable size, or twining shrubs bearing tendrils, or, though seldom, climbing herbs. Their timber has frequently several distinct axes of growth. Leaves alternate, compound, very rarely simple, with or without stipules, often marked with lines or pellucid dots. Flowers in racemes, or racemose panicles, small, white or pink, seldom yellow, ♂-♀. Calyx more or less deeply 4-5-parted, or 4-5-leaved, with an imbricated æstivation.

Petals 4-5, or occasionally absent, alternate with the sepals, hypogynous, sometimes naked, sometimes with a doubled appendage in the inside; æstivation imbricated. Disk fleshy; sometimes occupying the base of the calyx, regular, nearly entire, expanded between the petals and stamens; sometimes glandular, incomplete, the glands stationed between the petals and stamens. Stamens 8-10, rarely 5-6-7, very seldom 20, sometimes inserted into the disk, sometimes into the receptacle between the glands and the pistil; filaments free or combined just at the base; anthers turned inwards, bursting longitudinally. In the ♂ there is a very small rudiment of a pistil, or none. Ovary 3-celled, rarely 2-4-celled, the cells containing 1, 2, 3, very seldom more, ovules. Style undivided, or more or less deeply 2- or 3-cleft. Ovules anatropal, sessile when solitary, erect, or ascending, rarely suspended; when double, the upper ascending, the lower suspended. Fruit sometimes capsular, 2-3-valved, sometimes extended at the back into a wing and becoming a key (samara), sometimes fleshy and indehiscent. Seeds usually with an aril; the outer integument crustaceous or membranous, the interior pellucid. Albumen 0.

Embryo seldom straight, usually curved, or spirally twisted. Radicle next the hilum. Cotyledons incumbent, sometimes combined into a thick mass.

This Order is composed of a great diversity of species, which assume appearances widely different from each other; so that Botanists have not unnaturally supposed that it really contains the elements of several distinct Natural Orders. Thus the Horse-chesnuts have been separated because of their opposite leaves, and a singular peculiarity of the ovules, which are both erect and suspended in the same cell; and Meliosmeæ



Fig. CCLXVII.

Fig. CCLXVII.—*Sapindus senegalensis*. 1. an expanded flower; 2. a petal; 3. the ovaries before fertilisation; 4. a vertical section of a ripe drupe, showing the embryo.



have been set apart because of their fruit being a drupe, their stamens all suspended, and their stamens reduced to two only in a female condition. There does not, however, appear to be in these cases such differences from the true Soapworts as to stamp the supposed Orders with authority; and, as might have been expected, the progress of discovery does not sanction the separation by adding new members to each group. The true character of Soapworts resides in their unsymmetrical flowers, (the stamens never agreeing in number or power with the sepals,) in their anthers bending longitudinally, and in the petals having an appendage, while the seeds have an aril and the embryo is curved or spiral. But none of the latter characters are constant, and consequently the definition of the Order becomes very difficult. Even Maples they hardly differ. At least, the characters usually pointed out as distinguishing them are fallacious in practice. The opposite leaves of Maples are found in *Asculus* and others, and that genus has not appendages on its petals more than Acers itself, and a whole race of the Soapworts has samaroid fruit, which is the more obvious mark of the Order of Maples. To Milkworts they are no doubt akin in the singular combination of 5 stamens with 5 unequal sepals, and an uncertain number of petals; and also in their aril, which may be compared to the caruncula of Milkworts, although somewhat different in its origin. The dried leaves resemble, as De Candeille remarks, those of Comarads. Their climbing habit and tendency to produce tendrils indicate a relation to Vines, which, however, is not very near. Malpighiads are known with certainty by their symmetrical flowers, although they too have the "keys" or samaras that are so common among Soapworts. Pterocarya is certainly very near this Order; but, in addition to their constant want of petals, their carpel is always solitary, and absolutely simple.

A very general character of the Soapworts is to have their embryo either curved, or twisted spirally. This occurs in a remarkable manner in the nut of a *Dioscorea* tree, called the Snake-nut, in consequence of the large embryo resembling a snake coiled up. Sir R. Schomburgk, who first described this production in the *Annals of Natural History*, vol. 5. p. 294, has called the tree *Ophiorhizon paradoxum*. The accompanying figure represents it in a germinating condition. Another peculiarity resides in the trunk of such as have a climbing habit. These remarkable plants possess several distinct woody axes, held together by masses of cortical matter, so that they resemble several thick-barked stems, bound together with violence. Instances of this structure have been figured by *Comboudon*, at Plate XIII. of his *Recherches sur l'Oranger graphique*.

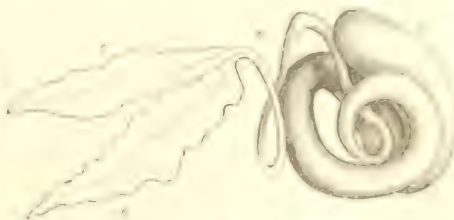


FIG. CCLXVIII.

Natives of most parts of the tropics, but especially of South America and India. Africa knows many of them, but they are wanting in the cold regions of the north. None are found wild in Europe. *Dioscorea* represents the Order in New Holland; Horse Chestnuts in the north of India, Persia, and the United States.

It is singular that while the leaves and branches of many of these plants are unquestionably poisonous, the fruit of others is valuable as an article of the diet. Thus the Longan, the Litchi, and the Rambutan, fruits among the more delicious of the Indian archipelago, are the produce of different species of *Nephelium*. *Paracarya* nutans and dulcis, to which belong the Rambah and Choopa of Malacca, and *Hedycarya* *malabarica* producing the Tampui, are other fruit trees of the Order. The fruit of *Schinus molle* *edulis* is known at desserts in Brazil, under the name of *Fruito do prego*; it is said to have a sweet and pleasant taste. Various species of *Sapindus* are mentioned as fruit trees. The blacks of Senegal highly value the berries of *S. senegalensis*; the fruit of *S. esculentus* is very fleshy, and much esteemed by the inhabitants of Congo, by whom it is called *Pittomba*. *Meliossea ligata*, a West Indian tree, is now cultivated in Brazil for its agreeable subacid vinous berries. The fruit of *Pappasapindus* is called *Widi* Franes at the Cape of Good Hope; its seeds almost burnt. The samaroid nut of the Akoe tree (*Blighia* or *Cupania sapida*), of *Paullinia sulcatissima*, and *S. blanchetii* *tripeta*, are also articles of food in their respective countries.

Nevertheless, these fruits belong to a race essentially dangerous; and, as in other



cases, appear to be parts in which the deadly juices of the branches and leaves are too much diffused among watery matter to be dangerous. For example, although the fruit of *Sapindus senegalensis* is eaten, its seeds are known to be poisonous; those of the eatable *Nephelia* are so bitter as to excite suspicion as to their nature; and it is asserted that both the fruit and leaves of the Buck-eye, or American Horse Chesnut, *Æsculus ohiotensis*, are a mortal poison, both to man and animals. In no part of this Order is the narcotic quality more developed than in the genus *Paullinia*. Of all the species, *P. pinnata* is supposed to be the worst; bark, leaves, and fruit abound in an acrid principle, and the Brazilian blacks prepare from them an insidious poison, which slowly but certainly destroys life. Martius suggests that the nature of this poison should be inquired into, and experiments made as to whether it may not be advantageously administered in hydrophobia and insanity. A venom for their arrows is prepared by the savages of Guiana from *Paullinia Cururu*; *P. australis* and *Serjania lethalis* are together supposed to furnish the Lecheguana honey, which has been found a most dangerous food. (See *Edinb. Ph. Journ.* 14. 269, and *Plantes Remarquables*, p. 192.) From *P. Cupana* an inebriating drink is prepared on the banks of the Oronoco. The leaves of *Magonia pubescens* and *glabrata*, called Tinguy in Brazil, are used for stupefying fishes; their bark is employed for healing sores in horses, caused by the stings of insects. *Serjania tritermata* is also employed as a fish poison. The roots of the American Horse Chesnut are held to be poisonous.

Some are used in medicine as astringents. The root of *Schmidelia serrata* is employed in India to stop diarrhoea. The bark of *Schleichera trijuga* is rubbed up with oil in the same country to cure the itch. The bark of the Horse Chesnut, *Æsculus Hippocastanum*, has been recommended as a valuable febrifuge in intermittent and other fevers; a decoction has been recommended in gangrene, and its powder as an errhine. Its young leaves are aromatic, and have been used instead of Hops in brewing beer, according to Endlicher. The fruits of *Blighia* (or *Cupania*) *sapida*, boiled down with sugar and cinnamon, are used in diarrhoea.

A saponaceous principle exists in a remarkable degree in certain species. The seeds of the common Horse Chesnut are not free from it. The acrid fruits of *Sapindus saponaria*, *inæqualis*, and others, lather freely in water, and are used in the West Indies instead of soap; "a few of them will cleanse more linen than 60 times their weight of soap." Pounded and thrown into water, they intoxicate fish. A tincture of the berries has been recommended in chlorosis. The distilled water of the flowers of *Blighia sapida* is regarded by negro women as a cosmetic, probably owing to the presence of the saponaceous matter just alluded to.

Notwithstanding these qualities, a food called Guarana bread is prepared by the Brazilian savages from the seeds of *Paullinia sorbilis*. Martius, who has investigated the nature of this substance, says that oblong or round cakes of it are sold all over Brazil as an indispensable requisite for travellers, and a cure for many disorders. His brother Theodore found them to be composed chemically of an astringent matter, forming a green precipitate with iron, resin, fat oil of a green colour, gum, starch, vegetable fibre, and a white crystalline bitter substance, which he called Guaraneine, and which appears to be identical with Theine and Caffeine. The Brazilians pound this bread in water, sweeten it, and esteem it as a stomachic, febrifuge, and aphrodisiac. Martius regards it as a substance of considerable activity ("nobile remedium"), and adds, "Appetitum venereum movet, spermatis vero fecunditatem diminuire dicitur."

In addition to the uses already indicated, Soapworts present occasionally other qualities. The root of *Cardiospermum Halicacabum* is diaphoretic, diuretic, and aperient. Its leaves are cooked as a vegetable in the Moluccas. The seeds of the Horse Chesnut are an excellent sheep-food,\* and have been recommended as a good substitute for Coffee. The *Dodonæas* are somewhat aromatic; the leaves of *D. viscosa* are used in baths and fomentations; the wood of *D. dioica* is carminative; *D. Thunbergiana* is said to be slightly purgative and febrifugal. The branches of *Plösslea floribunda*, a Cape plant, are covered with a gummy exudation. The timber of some of the South African trees of the Order appears to be valuable. That of *Pteroxylon utile* is said to be as hard and handsome as Mahogany; its sawdust makes the workmen sneeze, wherefore they call

\* Whilst I was at Geneva in the autumn of 1837, I observed every one collecting carefully the fruit of the Horse Chesnut, and on inquiry I learnt that the butchers and holders of grazing-stock bought it readily at a certain price per bushel. I inquired of my butcher, who himself kept a very extensive grazing farm, and he told me it was given to those sheep in particular that were fattening. The Horse Chesnuts were well crushed; something in the way, so I understood, that Apples are, previous to cider being made. They are crushed or cut up in a machine kept solely, in Switzerland, for that purpose; then about two pounds' weight is given to each sheep morning and evening. Sheep eat the food greedily; it must be portioned out to them, as too much would disagree with them, it being of a very heating nature. The butcher told me that it gave an excellent rich flavour to the meat. The Geneva mutton is noted for being as highly flavoured as any in England or Wales.—*Gardeners' Chronicle*, 1843, p. 737.



it Nieshout; it is found to burn rapidly, though green, and is used by the Hottentots for lighting their fires. *Hippobromia alatum*, commonly called *Pardipia*, is extensively employed for timber at the Cape of Good Hope.

## GENERA.

I. **SAPINDÆÆ**.—Leaves *Pinnatissimum*, *Blum.*  
*alternata*. Ovary generally solitary. Embryo curved, or occasionally straight.  
*Cardiospermum, Lam.*  
*C. acutum, Tournef.*  
*Erythrophila, E. M.*  
*Uvidora, H. B. K.*  
*Serjania, Plum.*  
*S. verna, Schumacher.*  
*Touhou, Aubl.*  
*Pimenta, Schreb.*  
*Bridsonia, Bart.*  
*Fraxinocarpus, Meisn.*  
**Paullinia, Linn.**  
*Samarillaria, R. et Pav.*  
*Curatia, Plum.*  
*Emourea, Aubl.*  
*Natalia, Hochst.*  
*Schmidelia, Lam.*  
*A. alba, Linn.*  
*oreocarpa, Juss.*  
*Tortuosdentron, Gärtn.*  
*Acumosa, Hochst.*  
*Aporosa, Forst.*  
*Gemella, Lour.*  
*Udus, Burm.*  
*Nassicia, Fl. Flum.*  
*Valenzuela, Bart.*  
*Irina, Bonn.*  
*Prasba, Gaud.*  
*Lepisanthes, Blum.*  
*Sapindus, Linn.*  
*Pappia, Eckl.*

*Hypolete, P. B.*  
*Sphaerocarpus, DC.*  
*Pachira, Moench.*  
*Melasma, Linn.*  
*Guarea, DC.*  
*C. verna, Scop.*  
*Schleichera, H. B. K.*  
*Cassipourea, Rumph.*  
*Kona, Gärtn.*  
*Pavonia, Jack.*  
*P. verna, Blum.*  
*Heliocarpus, Jack.*

II. **HIPPOCASTANÆÆ**.—Leaves opposite. Ovary 2 in each cell, one ascending, the other suspended. Embryo curved with great fleshy consolidated cotyledons.

*Ungadia, Eckl.*  
*Aleuris, Linn.*  
*Hippocastanum, Tourf.*  
*Pavia, Boerh.*  
*M. verna, Spach.*  
*Cathartus, Spach.*

III. **DENEGÆÆ**.—Leaves alternate. Ovary 2 or 3 in each cell. Embryo rolled spirally.

*Kolreuteria, Lam.*  
*Cossand, Cambess.*  
*Elagonea, R. et Pav.*  
*Ameria, Pers.*

*Deleteria, Linn.*  
*D. verna, Linn.*  
*Albida, Gaud.*  
*Hippocastanum, Moench.*  
*Opuntia, Linn.*

IV. **MILLETIÆÆ**.—Leaves alternate. Hypocotyl strongly ascending. Ovary 2 in each cell, one fertile. Ovary 2 in each cell, one fertile. Embryo rolled up. Fruit a large

*Melasma, Linn.*  
*Millettia, R. et Pav.*  
*Hippocastanum, Moench.*

**Anomalous Genera.**  
*Plossia, Eckl.*  
*Nathalia, Rumph.*  
*Magonia, St. Hil.*  
*Phacocarpus, M. et Pav.*

**doubtful Genera.**  
*Valentia, Scop.*  
*Racaria, Aubl.*  
*Ematias, Linn.*  
*Podocarpus, Linn.*  
*Pteroxylon, Eckl. et Zeyher.*  
*Hippobromia, Eckl. et Zeyher.*  
*Taranea, Linn.*  
*Hortenschium, N. et Pav.*

NUMBERS. GEN. 50. Sp. 380.

## FAMILIÆ.

POSITION.—Polygalaceæ.—SAPINDACEÆ.—Acernaceæ.

In Abyssinia the fruit of *Schmidelia africana* is used as a remedy for the tetter. When the fruit is dry it is peeled, mixed with flower, and converted into a kind of pâte, which is eaten.—*Ach. Richard.*

## ADDITIONAL GENERA.

? *Pinguipteron, Gaud.*  
*Leucomischus, P. B.*  
*Macphersonia, Blum.*  
*Jugosa, R. et Pav.*  
*Scorodendron, Blum.*  
*Zygocarpus, Tourn.*  
*Hemipyrus, R. et Pav.*  
*Dicynema, R. et Pav.*  
*Otenychnum, R. et Pav.*  
*Blanca, Blum.*  
*Schneekia, Karst.*  
*Lepidopetalum, Blum.*

*Axyra, Blum.*  
*Sphaerocarpus, Blum.*  
*Ochalea, Tourn.*  
*Leucomischus, R. et Pav.*  
*Gallia, R. et Pav.*  
*Neriphanthus, Blum.*  
*Albida, R. et Pav.*  
*Opuntia, Linn.*  
*Podocarpus, Linn.*  
*Rhodocarpus, Linn.*  
*Larrea, Linn.*

to Sapindaceæ.

to Sapindaceæ.

to Sapindaceæ.

to Sapindaceæ.



## ORDER CXXXVII. PETIVERIACEÆ.—PETIVERIADS.

Petiveriææ, *Agardh Classes*, (1825); *Endl. Gen.* p. 975.—Petiveriaceæ, *Link Handb.* 1. 392. (1829); *Ed. pr. clix.*; *Meisn. Gen.* p. 316.

DIAGNOSIS.—*Sapindal Exogens*, with *apetalous flowers and a solitary carpel*.

Under-shrubs or herbaceous plants, with an alliaceous odour. Leaves alternate, entire, with distinct stipules, often with minute pellucid dots. Flowers racemose or paniced. Calyx of several distinct leaves. Stamens between perigynous and hypogynous, either indefinite, or, if equal to the segments of the calyx, alternate with them. Ovary superior, 1-celled; style one; stigma lateral; ovule erect. Fruit 1-celled, indehiscent, dry, either wingless, wedge-shaped and spiny at the point, or extended at the back into a narrow flat wing (samara). Seed erect without albumen; embryo straight or curved; cotyledons convolute; radicle inferior.

According to Brown and Endlicher these plants are only a section of Phytolaccads. They are, however, distinguished by the presence of stipules, and by their straight exalbuminous embryo with spiral cotyledons. Their habit too is adverse to this approximation, while the key-like fruit of *Seguiera* and its inflorescence suggests a relationship to Soapworts, which does not seem removed by a comparison of the exact structure of the two. It is true that the latter Order in general has petals, and that Petiveriads have none; but then we have many apetalous genera among Soapworts. In both the seeds are erect, the exalbuminous embryo rolled up, the radicle inferior; and even in the number of their stamens they correspond, if we compare *Seguiera* with *Prostea*. In fact, instead of separating these Petiveriads from Soapworts by a long interval, they might almost be regarded as an apetalous form of that Order, with carpels reduced to one. It is to be observed that *Petiveria* and *Seguiera* are not entirely like one another, and that these remarks apply to *Seguiera* only.

West Indian or tropical American plants; for the *Seguiera asiatica* of Loureiro probably does not belong to the Order.

All the parts of *Petiveria alliacea*, the Guinea-hen weed of the West Indies, are excessively acrid; a small portion of the leaves chewed is said by Burnett to render the tongue as dry and black and rough as it appears in cases of malignant fever. The negroes consider it a sudorific, and say that vapour baths or fumigations of it will restore motion to paralysed limbs. The roots are used in the West Indies as a remedy for toothache; the negresses also administer it to procure abortion.—*Schomb. in Linnaea*, ix. 511. *P. tetrandra* is employed in Brazil under the name of Raiz de Pipi in warm baths and lotions, as a remedy for defective contractibility of the muscles, or in paralysis of the extremities arising from cold. It has an intense alliaceous odour.—*Martius*. The same writer informs us that the root, wood, and all the herbaceous parts of *Seguiera alliacea* have a powerful odour of garlic or asafetida; baths impregnated with them are in repute in Brazil in cases of rheumatism, dropsy, and hæmorrhoidal affections. Fomentations of the leaves and young branches are employed to alleviate tumours of the prostate; the wood abounds in potash, and the ashes are employed in clarifying sugar and in soap-making in Brazil.

## GENERA.

*Petiveria*, L. | *Seguiera*, L. | *Gallesia*, Casar.

NUMBERS. GEN. 3. Sp. 10.

*Phytolaccaceæ*.

POSITION.——————PETIVERIACEÆ.—Sapindacææ.

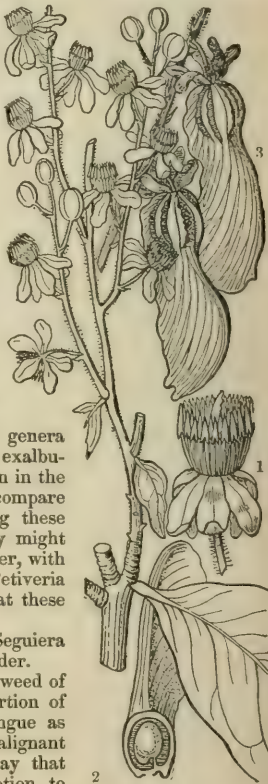


Fig. CCLXIX.



ORDER CXXXVIII. ACERACEÆ.—M<sub>111</sub>161.

*Agnes, Jour. Voy. at 1789; Ann. Mus. 18: 377. (1811).—Curtis, in: Phloë, at 2: 243. (1811).—Poir., L. 1821. (1821).—Lindl. Gen. exsist. 1: 161. (1821).—Müll. Arg. 1: 161. (1821).*

**DIAGNOSIS.**—*Sagittate leaves, with complete venation; flowers, petals united in 5, anthers opening longitudinally, 2 carpels, and style without an anther.*

**Trees.**—Leaves opposite, simple, usually with palmate veins, rarely pinnate, without stipules. Flowers often polygamous in many species or racemes. Calyx 5-lobed into 5, or occasionally from 4 to 9 parts with an interrupted division. Petals from 5 in number to the lobes of the calyx, imbricated, inserted round an hypogynous disk, or 0. Stamens inserted upon the disk, generally 5, not often any other number, always definite. Ovary free, 2-lobed; style 1; stigma 2; ovules in pairs, amphitropous, perispermous. Fruit formed of two nuts, which are indehiscent, with a narrow wing at the back (samaroid); each 1-celled, with 1 or 2 seeds. Seeds ascending, with a thickened lining to the testa; albumen none; embryo curved, with foliaceous wrinkled cotyledons, and an inferior radicle.

These plants differ from Soapworts in their fruit having but 2 carpels, the female never being furnished with seeds, and their opposite leaves. The distinction is however scarcely satisfactory, even when the want of an ard is added. From Malpighiaceæ their unsymmetrical flowers, inferior radicle, glandless calyx and palmate-veined leaves decidedly divide them.

Europe, the temperate parts of Asia, the north of India and North America, are the stations of this Order, which is unknown in Africa and the southern hemisphere.

The species are only known for the sweet sap of *Acer saccharinum* and others, from which sugar is extracted in abundance, and for their light useful timber. It is said, however, that their juices become acrid as the seasons advance. The bark is suberugent, and yields the dyer reddish brown and yellow colours.

\*My pupil, Mr. Buchanan, remarked that the roots of *Acer saccharinum* were abundantly in the month of June, a statement which I have never verified.

## GENERA.

*Acer* Linn.  
*Nyctax* Murr.  
*Sapindus* Juss.  
*Diospyros* Thunb.

NUMBERS. GEN. 1. 81. 20.

POSITION.—Pteridaceæ.—Asteraceæ.—Sagittaceæ.

Fig. CCLXX—1. *Acer saccharinum* (sagittate). 2. *Acer* (sagittate). 3. *Acer* (sagittate). 4. The same with the seed laid bare. 5. The embryo (sagittate).



## ORDER CXXXIX. MALPIGHIACEÆ.—MALPIGHIADS.

Malpighiaceæ, *Juss. Gen.* 252. (1789); *Ann. Mus.* 18. 479; *DC. Prodr.* 1. 577; *Endl. Gen.* ccxxviii.; *Adrien de Jussieu, Monogr.* (1843); *Wight Illust.* 1. 136.—Nitrariaceæ, *Ed. pr.* No. cxlix. (1830).

**DIAGNOSIS.**—*Sapindal Exogens*, with complete, partially symmetrical flowers, an imbricated calyx, naked stalked petals, ovules hanging by cords, simple stigmas, and usually a convolute embryo.

Trees or shrubs, often having a climbing habit. The leaves usually opposite or whorled, rarely alternate, simple, usually entire, generally stalked, and having glands on



Fig. CCLXXI

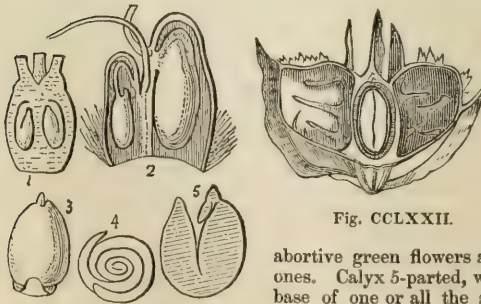


Fig. CCLXXIII.

Fig. CCLXXII.

the stalk or under side; stipules generally short and deciduous, occasionally larger, and intrapetiole. If there are any hairs they are fixed by their middle, and sometimes are stiff and brittle. The inflorescence is variable. The flowers ♂ or ♂-♀, red, or more commonly yellow, rarely white, and very rarely blue; in a few instances

abortive green flowers are intermixed with the perfect ones. Calyx 5-parted, with conspicuous glands at the base of one or all the segments, very rarely without glands; in æstivation quincuncial, seldom valvate. Petals 5, unguiculate, with a convolute æstivation. Stamens mostly double the number of the petals, often monadelphous, usually with a fleshy connective that projects beyond the lobes of the anthers. Carpels generally 3, rarely 2, very rarely 4, altogether or partially consolidated, often crested at the back; ovules solitary, orthotropal, rising up from a long pendulous cord, with which they form a sort of hook; styles distinct or united; stigmas the same number, simple, capitate, truncate, or variously expanded. Fruit very various; a drupe, or a woody nut, or samaroid, the wings of different forms and in different positions. Seed suspended obliquely by a short cord below the apex; albumen 0; embryo with a short superior radicle and

Fig. CCLXXI.—*Diploptis paralias*; 1. a flower-bud, showing the double glands of the calyx; 2. an expanded flower; 3. the carpels; 4. ripe fruit of *Rysopteris timorensis*.

Fig. CCLXXII.—*Jubelina riparia*, after *A. de Jussieu*.

Fig. CCLXXIII.—1. Section of ovary of *Malpighia*; 2. of *Coleostachys*; 3. embryo of *Burdachia*; 4. of *Byrsonima*; 5. of *Brachypterys*.—*A. de Jussieu*.



longer cylindrical, which are straight, and equal, or unequal, curved, or flattened, some rolled up, very thick, or bony.



FIG. CCXXXIV.

This remarkable Order has been treated at great length and with infinite skill by M. Adrien de Jussieu, from whom the principal part of the following and previous remarks is borrowed. Among the most striking peculiarities of the race is the presence upon the calyx of certain glands of such large size, sometimes, as to constitute a considerable part of the whole calycine apparatus; it is very remarkable that when these glands are missing, it is those which are next the outside of the inflorescence that disappear. They are secreting organs, and according to Payer, their excretions are (in certain Malpighias) of the nature of a fatty oil containing a fluid substance, besides one that is concrete. Another very remarkable circumstance is, the general tendency that has been observed among the stems of the climbing kinds, to assume an appearance quite anomalous among Exogens. In these instances there is in the beginning the formation of a woody circular stem round pith, but immediately afterwards the woody matter is deposited in the most irregular lobed and knotted mass. Many details relating to this matter have been given by M. Adrien de Jussieu. The resemblance between this Order and others in its classes, will be evident upon comparing the Diagrams already given; and will be further explained under the other Orders.

The genus *Nitraria*, consisting of a few salt plants from the west of Asia, the north of Africa, and N. Holland, appears to be not essentially distinct from the present Order, of which it has the unsymmetrical ovary, peculiar ovules, and drupaceous fruit. Its principal distinctions consist in the entire consolidation of its styles, and in the stamens being collected in pairs, lodged in the cavity of concave perianth. It has, however, given rise to a supposed Order,\* originally suggested in the first edition of the present work, No. 118, (1839), as possessing some affinity on the one hand with Chenopods, and the other with Buckthorns (Rhamnaceæ).



FIG. CCXXXV.

The following is the distribution of the Order, according to M. A. de J.: Africa: 14 on the continent; 11 in Madagascar; Asia:

\* The following is the character of the supposed Order, and is borrowed from the same source as the preceding: alternate leaves, which are sometimes bipinnate; flowers axillary, solitary, large, tubular, 5-toothed, fleshy. Corolla of five petals, which come from the base of the calyx, and are without visible attachment. Stamens 3 times the number of the petals, perianthaceous, without anthers, without filaments, without distinct attachment of dehiscence. Ovary superior, 3- or 4-lobed, with a reniform, pendulous, 12-rayed, or more are as many stigmatic lines as there are rays, or lobes, pendulous, or sessile, 12-rayed, or more. Fruit drupaceous, opening by 3 or 6 valves. Sometimes, with no filaments, and 4 stamens, with no rachis next the leaves.

FIG. CCXXXIV. — Wood of *Retortifera* (Asteraceæ), 1. A. B. *Retortifera*.  
FIG. CCXXXV. — *Nitraria* Schimper. 1. An expanded flower. 2. Longitudinal section of the ovary. 3. A proper decussate section of the ovary. 4. A single ovule. 5. A single stamen. 6. A single pistil. 7. A single fruit.



Arabia, India, and Ceylon 16, Indian Archipelago, China and Polynesia 14; West Indies 56; Mexico 61; South America 408, of which 290 come from Brazil. They are nearly all tropical.

Of the uses of the species of this Order little can be said. A large number are beautiful trees or climbers with gaudy flowers; and they seem to be generally astringent. Byrsonima bark is of common employment by tanners in Brazil, under the name of Murici. The wood of some kinds, especially Byrsonima verbascifolia, is bright red. The fruit of the Malpighias and Byrsonimas is eaten in the West Indies; the hairs of a few are painfully pungent. The bark of Byrsonima crassifolia, or Malpighia Moureila, according to Aublet, is employed in Cayenne as a febrifuge. That of the Chapara Manteca, Byrsonima crassifolia, is astringent, and is used in infusion or decoction taken inwardly, as an antidote to the rattlesnake bite; it is also employed successfully as a remedy for abscesses in the lungs. It is said that Alcornoco bark is the produce of Byrsonima laurifolia, rhopalæfolia, and coccolobæfolia. The acid astringent berries of Byrsonima spicata (Bois-tan) are prescribed in dysentery. It is said that the seed of Bunchosia armeniaca, a Peruvian tree, is poisonous.

#### GENERA.

MALPIGHIÆ, <i>A. de J.</i>	<i>Dialla</i> , <i>Grisb.</i>	III. HIRÆ, <i>A. de J.</i>	<i>Dinemandra</i> , <i>A. de J.</i>
<i>Malpighia</i> , <i>Plum.</i>	<i>Heladraia</i> , <i>A. de J.</i>	<i>Tristellateia</i> , <i>Pel. Th.</i>	<i>Dinemagonum</i> , <i>A. de J.</i>
<i>Byrsonima</i> , <i>Rich.</i>	<i>Thryallis</i> , <i>Mart.</i>	<i>Zymun</i> , <i>Noronh.</i>	IV. GAUDICHAUDEÆ, <i>A. de J.</i>
<i>Burdachia</i> , <i>A. de J.</i>	<i>Nitraria</i> , <i>L.</i>	<i>Hiptage</i> , <i>Gaertn.</i>	<i>Gaudichaudia</i> , <i>Kth.</i>
<i>Carusia</i> , <i>Mart.</i>	II. BANISTERIÆ, <i>A. de J.</i>	<i>Gærtnera</i> , <i>Schreb.</i>	<i>Aspicarpa</i> , <i>Lga.</i>
<i>Coleostachys</i> , <i>A. de J.</i>	<i>Lophopterys</i> , <i>A. de J.</i>	<i>Molina</i> , <i>Cav.</i>	<i>Acosmus</i> , <i>Desv.</i>
<i>Lophanthera</i> , <i>A. de J.</i>	<i>Brachypterys</i> , <i>A. de J.</i>	<i>Succowia</i> , <i>Dennst.</i>	<i>Camarea</i> , <i>St. Hil.</i>
<i>Pterandra</i> , <i>A. de J.</i>	<i>Stigmaphyllon</i> , <i>A. de J.</i>	<i>Triaspis</i> , <i>Burch.</i>	<i>Janusia</i> , <i>A. de J.</i>
<i>Verrucularia</i> , <i>A. de J.</i>	<i>Ryssopterys</i> , <i>Blume.</i>	<i>Flabellaria</i> , <i>Cav.</i>	<i>Schwannia</i> , <i>Endl.</i>
<i>Galphimia</i> , <i>Cav.</i>	<i>Banisteria</i> , <i>L.</i>	<i>Aspidopterys</i> , <i>A. de J.</i>	<i>Fimbriaria</i> , <i>St. Hil.</i>
<i>Thryallis</i> , <i>L.</i>	<i>Peixotoa</i> , <i>A. de J.</i>	<i>Triopterys</i> , <i>L.</i>	GENERA INSUFFICIENTLY KNOWN.
<i>Spachea</i> , <i>A. de J.</i>	<i>Heteropterys</i> , <i>Kth.</i>	<i>Tetrapteryx</i> , <i>Cav.</i>	<i>Caucanthus</i> , <i>Forsk.</i>
<i>Meckelia</i> , <i>Mart.</i>	<i>Tricomaria</i> , <i>Hk. et Arn.</i>	<i>Hiræa</i> , <i>Jacq.</i>	<i>Platynema</i> , <i>Wight et A.</i>
<i>Bunchosia</i> , <i>Rich.</i>	<i>Aceridocarpus</i> , <i>Guillem.</i>	<i>Mascagnia</i> , <i>Bert.</i>	<i>Bembix</i> , <i>Lour.</i>
<i>Malacmæa</i> , <i>Gris.</i>	<i>Anonalopteris</i> , <i>G. Dn.</i>	<i>Diplopterys</i> , <i>A. de J.</i>	
<i>Echinopteris</i> , <i>A. de J.</i>		<i>Jubelina</i> , <i>A. de J.</i>	

NUMBERS. GEN. 42. Sp. 555.

POSITION.—Aceraceæ.—MALPIGHIACEÆ.—Sapindaceæ.

Mr. Munby is of opinion that the *Nitraria tridentata* of Desfontaines, brought from the desert of Soussa near Tunis, is the true Lotus tree of the ancients. It is called Damouch by the Arabs, who are aware of the semi-intoxicating qualities of its berry, much more likely to give rise to the fame of the Lotus than the dry and unpleasant fruit of the *Zizyphus lotus*, or that of the *Celtis australis*, to each of which the food of the Lotophagi has been in turn referred.—*Annals of Natural History*.

This genus *Nitraria* has been fully described by Messrs. Jaubert and Spach, (*Ann. sc. 3 ser. XIII.*, 21), who remark, among other things, that the hilum is on the side of the seed most remote from the axis.

#### ADDITIONAL GENUS.

*Blepharandra*, *Grisb.* near *Coleostachys*.



## Ottewill, C.N.L. ERYTHRONYLACTATE. I. ERYTHRONYLACTATE.

Fraxino-*salicetum*, *Rhodod. Hoffm.*, *S. O.*, *Ann. b. Bot.* 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635,

**Diagnosis.**—*Squid-like Pigeon*, with complete, possibly asymmetrical fusion of lower caudal vertebrae, pedals with an appendage, usually prominent, rarely complete process, and a straight culmen.

Shrubs or trees; young shoots often compressed and covered with brown membranous scales. Leaves alternate, usually smooth; stipules within the petioles. Flowers small, whitish or greenish. Peduncles axillary, solitary or clustered, emerging from numerous imbricated scale-like bracts. Sepals 5, confluent at the base, persistent. Petals 5, hypogynous, broad at the base, with a plaited scale there, equal, the margins lying upon each other in aestivation. Stamens 10, monodelphous; anthers intrate, erect, 2-celled, dehiscent lengthwise. Ovary 3-celled, with 2 cells spurious; styles 3, distinct, or united almost to the point; stigmas 3, capitate; ovule solitary, pendulous, anatropal, not suspended by a cord. Fruit drupaceous, 1-seeded. Seed angular; albumen between fleshy and mealy, or 0; embryo straight, central; cotyledons plano-convex; radicle superior, taper, straight.

The Erythroxyls are distinguished from the Malpighiads by their flowers growing from amongst small imbricated scales, having no glands on the calyx, a pair of parallel membranous plates on the petals, capitate stigmas, and ovules which are truly anatropal, without any cord to connect them with the placentæ. These marks are, however, hardly sufficient for the characteristics of a Natural Order, and it would perhaps be better to merge the Order in the Malpighiads, as has been done with Nitraria. An elaborate account of the genus will be found in Martius's Memoir, above quoted.

Chiefly West Indian and South American. A few are found in the East Indies, several in the Mauritius and Madagascar, and one in New Holland. Brazil within the tropics is their favourite haunt.

The wood of some is bright red; that of *E. hypericifolium*, is the Bois d'huile of the Isle of France. A permanent reddish brown dye is obtained from the bark of *Erythroxylum suberosum*, called in Brazil Gallinha choeca and Mercurio do campo. *E. areolatum*, a shrub found near Carthagena, is said to have some medical value; its young branches are refrigerant, its bark tonic, from the juice of the leaves is prepared an ointment employed against scald head, and the subacid juice of its fleshy fruit is purgative and diuretic. The latex of the root of *E. anguifugum* is regarded as an alexipharmic in Brazil; that of *E. campestre* is employed in the same country as a purgative. *Materia Medica, Linnaea*.

Peru for its remarkable power in stimulating the nervous system, in which respect it quite resembles opium. Its leaves are chewed with a small mixture of finely powdered shells. No effects that have been ascribed to the immoderate use of opium are exempted by what must be the consequence of chewing the Coca leaf. See a curious account of this plant in *Fanny's Reise in Chile*.



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## 61215

1.  $\text{Fe}^{2+}$  2.  $\text{Fe}^{3+}$  3.  $\text{Fe}^{2+}$  4.  $\text{Fe}^{3+}$  5.  $\text{Fe}^{2+}$  6.  $\text{Fe}^{3+}$  7.  $\text{Fe}^{2+}$  8.  $\text{Fe}^{3+}$  9.  $\text{Fe}^{2+}$  10.  $\text{Fe}^{3+}$  11.  $\text{Fe}^{2+}$  12.  $\text{Fe}^{3+}$  13.  $\text{Fe}^{2+}$  14.  $\text{Fe}^{3+}$  15.  $\text{Fe}^{2+}$  16.  $\text{Fe}^{3+}$  17.  $\text{Fe}^{2+}$  18.  $\text{Fe}^{3+}$  19.  $\text{Fe}^{2+}$  20.  $\text{Fe}^{3+}$  21.  $\text{Fe}^{2+}$  22.  $\text{Fe}^{3+}$  23.  $\text{Fe}^{2+}$  24.  $\text{Fe}^{3+}$  25.  $\text{Fe}^{2+}$  26.  $\text{Fe}^{3+}$  27.  $\text{Fe}^{2+}$  28.  $\text{Fe}^{3+}$  29.  $\text{Fe}^{2+}$  30.  $\text{Fe}^{3+}$  31.  $\text{Fe}^{2+}$  32.  $\text{Fe}^{3+}$  33.  $\text{Fe}^{2+}$  34.  $\text{Fe}^{3+}$  35.  $\text{Fe}^{2+}$  36.  $\text{Fe}^{3+}$  37.  $\text{Fe}^{2+}$  38.  $\text{Fe}^{3+}$  39.  $\text{Fe}^{2+}$  40.  $\text{Fe}^{3+}$  41.  $\text{Fe}^{2+}$  42.  $\text{Fe}^{3+}$  43.  $\text{Fe}^{2+}$  44.  $\text{Fe}^{3+}$  45.  $\text{Fe}^{2+}$  46.  $\text{Fe}^{3+}$  47.  $\text{Fe}^{2+}$  48.  $\text{Fe}^{3+}$  49.  $\text{Fe}^{2+}$  50.  $\text{Fe}^{3+}$  51.  $\text{Fe}^{2+}$  52.  $\text{Fe}^{3+}$  53.  $\text{Fe}^{2+}$  54.  $\text{Fe}^{3+}$  55.  $\text{Fe}^{2+}$  56.  $\text{Fe}^{3+}$  57.  $\text{Fe}^{2+}$  58.  $\text{Fe}^{3+}$  59.  $\text{Fe}^{2+}$  60.  $\text{Fe}^{3+}$  61.  $\text{Fe}^{2+}$  62.  $\text{Fe}^{3+}$  63.  $\text{Fe}^{2+}$  64.  $\text{Fe}^{3+}$  65.  $\text{Fe}^{2+}$  66.  $\text{Fe}^{3+}$  67.  $\text{Fe}^{2+}$  68.  $\text{Fe}^{3+}$  69.  $\text{Fe}^{2+}$  70.  $\text{Fe}^{3+}$  71.  $\text{Fe}^{2+}$  72.  $\text{Fe}^{3+}$  73.  $\text{Fe}^{2+}$  74.  $\text{Fe}^{3+}$  75.  $\text{Fe}^{2+}$  76.  $\text{Fe}^{3+}$  77.  $\text{Fe}^{2+}$  78.  $\text{Fe}^{3+}$  79.  $\text{Fe}^{2+}$  80.  $\text{Fe}^{3+}$  81.  $\text{Fe}^{2+}$  82.  $\text{Fe}^{3+}$  83.  $\text{Fe}^{2+}$  84.  $\text{Fe}^{3+}$  85.  $\text{Fe}^{2+}$  86.  $\text{Fe}^{3+}$  87.  $\text{Fe}^{2+}$  88.  $\text{Fe}^{3+}$  89.  $\text{Fe}^{2+}$  90.  $\text{Fe}^{3+}$  91.  $\text{Fe}^{2+}$  92.  $\text{Fe}^{3+}$  93.  $\text{Fe}^{2+}$  94.  $\text{Fe}^{3+}$  95.  $\text{Fe}^{2+}$  96.  $\text{Fe}^{3+}$  97.  $\text{Fe}^{2+}$  98.  $\text{Fe}^{3+}$  99.  $\text{Fe}^{2+}$  100.  $\text{Fe}^{3+}$

NUMBERS, GEN. 1. 5-7.

Position. ———. Eurythmion (1890). ———. Mammillaria.

[illegible]



## ALLIANCE XXX. GUTTIFERALES.—THE GUTTIFERAL ALLIANCE.

DIAGNOSIS.—*Hypogynous Exogens*, with *monodichlamydeous flowers*, *axile placentæ*, an *imbricated calyx*, an *imbricated or twisted corolla*, *∞ stamens*, and an *embryo with little or no albumen*.

The true passage from Sapindals into this Alliance is from Soapworts to Rhizobols; for the habit of *Æsculus* in the former is the same as that of most of the latter, and they nearly correspond in their structure. But Rhizobols have an indefinite number of stamens. It is in that respect indeed that Guttiferals principally differ from Sapindals, and the former may be almost regarded as a polyandrous form of the latter. It is however customary to find no want of symmetry in the calyx, corolla, and stamens of Guttiferals, while the reverse is generally characteristic of Sapindals. These too have seldom, if ever, resinous secretions; while, on the other hand, those are often remarkable for their abundance of resin.

The near relationship of all the Orders here collected is undisputed. They lean towards the diclinous structure in some Guttifers, and approach the diclinous series in the Dipterads, which have a strong analogy to Mastworts.

## NATURAL ORDERS OF GUTTIFERALS.

- |   |                        |
|---|------------------------|
| <i>Leaves simple, alternate, with large convolute stipules. Flowers symmetrical. Petals equilateral. Calyx unequal, permanent, winged. Anthers beaked. Fruit one-celled, one-seeded . . .</i> | } 141. DIPTERACEÆ.     |
|   |                        |
| <i>Leaves simple, alternate, without stipules or with very small ones. Flowers symmetrical. Petals equilateral. Anthers versatile. Seeds few or single. Stigmas on a long style . . . . .</i> | } 142. TERNSTRÖMIACEÆ. |
|   |                        |
| <i>Leaves digitate, opposite. Flowers symmetrical. Petals equilateral. Stigmas sessile. Seeds solitary. Embryo with an enormous radicle . . . . .</i>   | } 143. RHIZOBOLACEÆ.   |
|   |                        |
| <i>Leaves simple, opposite, without stipules. Flowers symmetrical. Petals equilateral. Anthers adnate, beakless. Seeds solitary or few. Stigmas sessile, radiating . . . . .</i>              | } 144. CLUSIACEÆ.      |
|   |                        |
| <i>Leaves simple, alternate, without stipules. Flowers unsymmetrical. Petals equilateral. Anthers versatile. Seeds innumerable, minute. Stigmas sessile . . . . .</i>                         | } 145. MARCGRAVIACEÆ.  |
|   |                        |
| <i>Petals oblique, glandular. Seeds numerous, naked. Styles long, distinct . . . . .</i>  | } 146. HYPERICACEÆ.    |
|   |                        |
| <i>Petals oblique, glandless. Seeds few, shaggy. Styles long, distinct . . . . .</i>  | } 147. REAUMURIACEÆ.   |
|   |                        |



## Only ONE DIPTEROCALYX!

[illegible]

**Diagnosis.** *Halophilol Eucaris*, with simple subventral bristles, large posterior segment, symmetrical flange, apical teeth, no areolae, prominent, subventral large bristles without, and a limited rounded head.

Gigantic trees, abounding in various sizes. Leaves alternate, lay out in vertical

with veins running out from the midrib to the margin; stipules deciduous, oblong, convolute, terminating the branches with a taper point. Flowers usually large; the racemes terminal and pendulous, or axillary and solitary, or several from the same leaves, or from the axils, often one-sided. Calyx tubular, 5-lobed, unequal, persistent, and afterwards enlarged, naked at the base; aestivation imbricated. Petals hypogynous, sessile, often combined at the base; aestivation contorted. Stamens indefinite, hypogynous, distinct, or slightly and irregularly polyadelphous; anthers innate, subulate, opening longitudinally towards the apex; filaments dilated at the base. Ovary superior, without a disk, 3-celled; ovules in pairs, pendulous; style single; stigma simple. Fruit coriaceous, 1-celled by abortion, 3-valved or indehiscent, surrounded by a calyx having tough leafy enlarged permanent divisions which crown the fruit. Seed single, without albumen; cotyledons plano-convex, or more commonly twisted and crumpled; radicle superior.

FIG. 10. N. Y. D.



FEBRUARY 1998

FIG. CCXCVII.—*Dactylopusia* *fraxinea*.—Stages of the embryo. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 83



of the schemes for classification which Botanists have hitherto employed. It has, for example, the peculiar rolled-up stipules which occur in Magnoliads; while the Oak is strikingly like Dipterads in foliage, in the germination of the seeds, which takes place underground without the cotyledons rising into the air, and in a constant tendency to lose the major part of the ovules in the process of maturing one; it is also to be remarked that the hard cupule or involucre of Mastworts (Corylaceæ) is much like the hardened calyx of these Dipterads. It is herein, indeed, that the great feature of the latter resides; we have nothing elsewhere exactly like the long wing-like lobes of their calyx. Botanists generally contrast Dipterads with the Elæocarpeous division of Lindenblossoms, but the imbricate calyx, diskless flowers, and peculiar fruit indicate a distant relationship only. The resinous juice, compound superior ovary, drupaceous fruit, numerous long anthers, irregular coloured calyx, and single exalbuminous seed, ally Dipterads, as Blume remarks, to Guttifers, from which their stipules and the æstivation of the corolla abundantly distinguish them.

Only found in India, and especially in the eastern islands of the Indian Archipelago, where, according to Blume, they form the largest trees of the forest. *Shorea robusta* limits the northern distribution of the Order, being found all along the foot of the Himalayas.

All the species seem filled with balsamic resin, which assumes various forms. *Dryobalanops camphora* yields the hard Camphor of Sumatra; this substance is found in a concrete state in cavities and fissures in the heart of the tree; it is less volatile than the common camphor of commerce; the same tree, which is fully described in Blume's *Flora Javæ*, also yields the camphor-oil of Borneo and Sumatra; the latter is supposed to be camphor in a partially formed state. *Shorea robusta* produces a balsamic resin used in the temples of India under the name of Ral or Dhoona; Saul, the best and most extensively used timber in India, is produced by the same tree. *Vateria indica* furnishes the resin called in India Copal (in England known by the name of Gum animi), and very nearly approaching the true resin of that name; in its recent and fluid state it is used as a varnish (called Piney varnish) in the south of India, and, dissolved by heat, in closed vessels, is employed for the same purpose in other parts of India; it is extremely tenacious and solid, but melts at a temperature of  $97\frac{1}{2}$  Fahr. Dr. Wight tells us that the natives obtain it by the simple process of cutting a notch in the tree, sloping inwards and downwards; the resin collects there and soon hardens. Under the name of Piney Dammar this most useful substance is applied in India to many purposes; it forms an excellent varnish, and on the Malabar coast is made into candles which "diffuse in burning an agreeable fragrance, give a clear bright light, with little smoke, and consume the wick so as not to require snuffing. Some of these candles, that were sent home, were highly prized and sold for very high prices" (Wight), but their importation was stopped by the excessive duties that were levied upon them. The resin of *Dipterocarpus trinervis* is found an excellent material for plaisters; and made into tincture, or formed into an emulsion with yolk of egg, it acts upon the mucous membranes like Balsam of Copaiva.—Blume. The natives of Java smear the leaves of the Plantain with this resin, and so form torches, which are said to yield a white light and to produce a not unpleasant smell. Other kinds of resin are furnished by other species; as, by *Shorea robusta* and *Tumbagaia*, the dhoona or dammer pitch, generally used in India for marine purposes, and as incense; by various species of *Dipterocarpus*, the balsam called by the natives of India Gurjun, by the Cinghalese Dhoonatil, and by the English Wood-oil. This also is used like Balsam of Copaiva.

#### GENERA.

<i>Dipterocarpus</i> , Gärtn.	<i>Anisoptera</i> , Korth.	<i>Isaaxis</i> , Arn.	<i>Vatica</i> , Linn.
<i>Pterygium</i> , Corr.	<i>Dryobalanops</i> , Gärtn. f.	<i>Scidalia</i> , Kostel.	<i>Shorea</i> , Roxb.
<i>Caryolobis</i> , Gärtn.	<i>Vateria</i> , Linn.	<i>Retinodendron</i> , Korth.	<i>Hopea</i> , Roxb.

NUMBERS. Gen. 7. Sp. 47.

#### *Tiliaceæ.*

POSITION.—*Ternströmiaceæ.*—*DIPTERACEÆ.*—*Clusiaceæ.*

#### *Corylaceæ.*

M. Planchon refers to the neighbourhood of this order the genus *Ancistrocladus* Wall (*Bigamea* Endl., *Wormia* Vahl), placed doubtfully in the last edition at the end of *Combretaceæ*. He regards it as the type of an order which he proposes to call *ANCISTROCLADEÆ*. (*Ann. sc. 3 ser. XIII. 316.*)



*Tricostema* = *Phyt.* Under this name Mr. Engelm. proposed to establish an Order, of which the following is the description: "Tree from tropical Africa, having a pyramidal form, very branched and very hairy. Leaves alternate, stipuled, ovate entire, with rounded veins, and a pointed stalk; stipules very small and shortly pointed on each side of the leaf-stalk at the base. Flowers pedunc, axillary and terminal; pedicels yellow, with attractive flower stalks which are pointed above the base, and furnished with 2 very small bracts at the articulation. Sepals 5, the 3 inner smaller and connate, the two outer opposite, larger, and thickly expanded into a pair of wings. Petals 5, hypogynous, without claws, their points twisted together in aestivation, eventually spreading; the Stamens hypogynous, indistinct, mostly in two rows; filaments filiform, short; anthers 2-lobed, their cells linear, opposite, pointed apically, opening at the point by a lateral slit. Disk 6-crested, central, one-lobed; ovules 60, long, curved backward, thick, placed upon a thick free basal placenta; stigma 2, very small, twisted, radial. Nut leafy, spindle-shaped, contracted at the base, and consolidated with the enlarged calyx, one-lobed, and by abortion one-sided. Seeds erect, with a thin membranous skin. Embryo without albumen; cotyledons amygdaloid, plano-convex, radicle very short, incurved, inferior. — The solitary genus which constitutes this Order is allied to nothing yet known. It is very different from Dipterocarpaceæ (Dipteraceæ), with which it is associated because of its two enlarged craxy leaves, and yet it can scarcely be separated from the Guttiferæ class." *Endlicherian*, p. 326. — In his Guttiferous class Mr. Engelm. included Dipterocarpaceæ, Ternstroemiaceæ, Clusiaceæ, Mimosaceæ, Hippuridaceæ, Elatinaceæ, Rhamnaceæ, Tamaricaceæ. It must be confessed that none of these present any marked resemblance to *Lophira*, which is the Scrubby Oak of Sierra Leone, except Dipterocarpaceæ and Guttiferæ. To the irregular front of the former that of *Lophira* is quite similar; but the ovary is one-celled, with a row of ovules upon a free central placenta, its seed is solitary with the radicle downwards, and the cotyledons are plano-convex, all points of difference from Dipterocarpaceæ, which have an ovary with 3 cells, a pair of parietal ovules in each a seed with the radicle upwards, and crumpled cotyledons. Moreover *Lophira* wants the large stipules of Dipterocarpaceæ. On the other hand, its flower is so like that of *Calophyllum*, a genus of Guttiferæ, that the one might be mistaken for the other, except that the leaves of *Lophira* are alternate; but in all the structure of the fruit the genus differs from the Guttiferous Order. Nevertheless, although *Lophira* is so different from Dipterocarpaceæ it is to be observed that it agrees with that Order not alone in its peculiar calyx; for in both cases the axes are anastroped, and consequently the radicle is directed to the base, and in *Lophira* there is an evident tendency to produce the long axes which are so characteristic of Dipterocarpaceæ. The late M. Goussier regarded it as being absolutely a Dipterocæ, because "of the convolute aestivation of the petals, the length of the 2 sepals extended into membranous wings, one of them being moreover cut at all proportion to the others, the alternate leaves furnished with little deciduous stipules, and the dry corky bark not filled with milky secretions." See *Flora Senegalica* *Tenore*, p. 119.

GUNPS.  
*Lophira*, *Banks*.



FIG. 3388-3393.

FIG. 3388-3393. *Lophira alata*. — *FIG. 3388*, a branch; *FIG. 3389*, a perpendicular section of a fruit; *FIG. 3390*, a perpendicular section of a fruit.



## ORDER. CXLII. TERNSTRÖMIACEÆ.—THEADS.

*Ternströmiæ*, *Mirbel. Bull. Philom.* 331. (1813).—*Ternströmiaceæ*, *DC. Mém. Soc. H. N. Genev.* vol. 1 (1823); *Prodr.* 1. 523. (1824); *Cambessés Mémoire*, (1828); *Endl. Gen.* ccxv.; *Meisn. Gen.* p. 40.; *Wight Illustr.* 1. p. 94.—*Theaceæ*, *Mirb. Bull. Phil.* (1813).—*Camelliæ*, *DC. Théor. Elém.* ed. 1. (1813); *Prodr.* 1. 529. (1824).

**DIAGNOSIS.**—*Guttiferal Exogens*, with simple alternate leaves, without stipules or with very small ones, symmetrical flowers, equilateral petals, versatile anthers, few or single seeds, and stigmas on a long style.

Trees or shrubs. Leaves alternate, coriaceous, generally without stipules, usually undivided, now and then with pellucid dots. Peduncles axillary or terminal, articulated



Fig. CCLXXIX.

at the base. Flowers generally white, seldom pink or red, occasionally polygamous. Sepals 5 or 7, imbricated in aestivation, concave, coriaceous, deciduous, the innermost often the largest. Petals 5, 6, or 9, not equal in number to the sepals, often combined at the base. Stamens ∞, hypogynous; filaments filiform, monadelphous or polyadelphous, or distinct; anthers versatile, or adnate, 2-celled, opening longitudinally; ovary superior, with several cells; styles from 3 to 7, filiform, more or less combined; ovules pendulous, or erect, or peltate. Capsule 2-7-celled and capsular, with the dehiscence taking place in various ways; sometimes coriaceous and indehiscent; usually with a central column. Seeds attached to the axis, large, very few; albumen none, or in very small quantity; embryo straight, bowed, or folded back, the radicle turned to the hilum; cotyledons very large, often filled with oil, occasionally plaited lengthwise; an aril sometimes present.

This Order originated in 1813, with Mirbel, who separated some of its genera from Citronworts, where they had been placed by Jussieu, and at the same time founded another closely allied Order, under the name of Theads. These opinions were substantially adopted by Kunth and De Candolle the latter of whom, moreover, formed several sections among the genera. Since that time the Theads have attracted the attention of several Botanists, especially of M. Cambessés, whose views are generally adopted. He, however, combines under this Order genera with axile and parietal placentation, with truly albuminous and exalbuminous seeds, with large amygdaloid embryos, and those whose embryo is too small to be easily found among its copious albumen, to say nothing of other differences of considerable moment. It is therefore difficult to suppose that such an arrangement can be maintained; and at least we must, I think, remove a genus called *Saurauja*, consisting of about 30 Asiatic trees or shrubs, in which there is a tendency to form a monopetalous corolla, an infinite number of minute seeds, a very small embryo lying in the base of abundant albumen, and anthers opening by pores; it

Fig. CCLXXIX.—*Kielmeyera rosea*. 1. the pistil; 2. a transverse section of it; 3. a ripe fruit; 4. embryo.







## ORDER CXLIII. RHIZOBOLACEÆ.—RHIZOBOLS.

Rhizoboleæ, *DC. Prodr.* 1. 599. (1824); *Cambessédes in Aug. St. Hl. Fl. Bras. Merid.* 1. 322. (1827); *Endl. Gen.* cccxxi.

**DIAGNOSIS.**—*Guttiferal Exogens, with digitate opposite leaves, symmetrical flowers, equal-lateral petals, sessile stigmas, solitary seeds, and an embryo with an enormous radicle.*

Trees of very large size. Leaves opposite, digitate, coriaceous, with a jointed stalk and no stipules. Flowers large, regular, arranged in racemes, with their stalks jointed

at the base and below the apex. Sepals 5 or 6, more or less combined, imbricated in æstivation. Petals 5 to 8, equal-sided but unequal, thickish, arising along with the stamens from a hypogynous disk. Stamens extremely numerous, slightly monadelphous, arising in a double row from a disk, the innermost being shorter and often abortive; anthers roundish, 2-celled, opening lengthwise. Ovary superior, 4 or 5, or even many-celled; styles as many as the cells; stigmas minute; ovules solitary, attached to the axis by their middle, semianatropal, with the foramen uppermost. Fruit formed of several combined nuts, part of which are sometimes abortive; each nut indehiscent, 1-seeded, 1-celled, with a thick double putamen. Seed reniform, without albumen, with a funicle which is dilated into a spongy exerescence; radicle very large, constituting nearly the whole of the almond-like substance of the nut, with a long 2-edged caulicle, having two small cotyledons at the top, and lying in a furrow of the radicle.

This very distinct Order De Candolle thought allied to Soapworts in its hypogynous flowers and its fruit; and especially to *Æsculus* on account of its opposite compound palmate leaves; but in that genus the radicle is small, and the cotyledons very large, while in Rhizobols the radicle is enlarged, and the cotyledons small. It however appears to be with Guttifers that Rhizobols best agree. "In these two Orders we find the leaves opposite and articulated at their base, hypogynous petals, a similar æstivation, numerous hypogynous stamens, and exalbuminous seeds. The large flowers of *Caryocar* call to mind those of most Guttifers; its inflorescence is nearly that of *Moronobea*; its fruit has a relation to that of *Mammea*, and presents, in that genus, as in several others of the same Order, a single seed in each cell."—*Camb. in Aug. St. H. Fl. Bras.* 1. 323. Endlicher traces a resemblance between them



Fig CCLXXX.

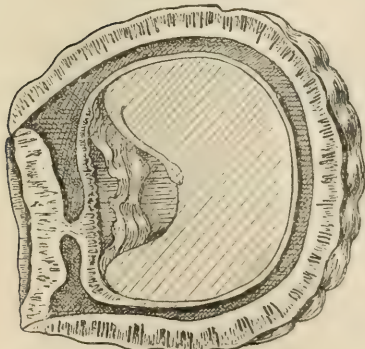


Fig CCLXXXI.

Fig. CCLXXX.—*Anthodiscus trifoliatus*. 1. a flower bud; 2. a flower; 3. a perpendicular section of the pistil.

Fig. CCLXXXI.—*Caryocar butyrosium*; a section of one of the lobes of its fruit.



and *Torelonthis*, through the intervention of *Moringena* among the Legum. Their great peculiarity is the seeds having a rind of cartilaginous bark, compared with the cotyledons. If it were not for that, the Order could not be satisfactorily distinguished from Guttifera.

A few large trees, found in the forests of the hottest parts of South America, constitute the whole of this Order.

It is from trees belonging to it that are produced the *Sambar* (or *Sommaron*) Nuts in the shops, the kernel of which is one of the most delicious fruits of the east that is known. An oil is extracted from them not inferior to that of the Olive. They chiefly come from *Caryocar butyrosuam*, the wood of which is said to be of much value in shipbuilding. These nuts must not be confounded with what are called Brazil Nuts, which are the seed of *Bertholletia excelsa*, a genus of the Myrtal Alliance. The fruit of *Caryocar butyrosuam* (*Péhea tuberosuosa*) is excellent for shipbuilding, plank-work, planks, &c., according to Schomburgk, who also speaks of another timber tree of this Order, known under the name of *Cakaralli* or *Kakaralli*, whose bark consists of numerous layers, which the Indians, by beating, separate till they are as thin as vellum paper, when they use them as wrappers for cigars. Is not this the very excellent *Leucythis ollaria* (See *LECYTH.*).

# GENERA.

<i>Caryocar</i> Lam.		<i>Péhea</i> Aubl.
<i>Myrciaria</i> Gertn.		<i>Sambor</i> Aubl.
<i>Amorimia</i> Gray, Arn.		<i>Amorimia</i> G. W. F. M. &c.

NEWBOLD, *Gen. 2. Sp. 3.*

POEYER, *Clus. 2. Rhizophoraceæ.*  
*Sagittifera*.



## ORDER CXLIV. CLUSIACEÆ.—GUTTIFERS.

*Guttiferæ*, Juss. Gen. 243. (1789); *DC. Prodr.* 1. 557. (1824); *Meisner*, p. 42; *Wight Illustr.* 1. 114; *Cambessèdes, Mémoire* (1828).—*Clusiaceæ*, Ed. pr. lv. (1836).

**DIAGNOSIS.**—*Guttiferal Exogens*, with simple opposite leaves, without stipules, symmetrical flowers, equilateral petals, adnate beakless anthers, solitary or few seeds, and sessile radiating stigmas.

Trees or shrubs, occasionally parasitical, yielding resinous juice. Leaves without stipules, opposite, coriaceous, entire, with a strong midrib, and often with the lateral veins running through to the margin. Flowers usually numerous, axillary, or terminal,



Fig. CCLXXXII.

white, pink, or red, articulated with their peduncle, ♂ or ♀ by abortion. Sepals 2, 4, 5, 6, or 8, imbricated by alternate pairs, usually persistent, round, membranous, frequently unequal and coloured like petals. Petals hypogynous, equal in number to the sepals, or the same power, and sometimes passing insensibly into them. Stamens numerous, either distinct, or combined in one or more parcels, hypogynous, rarely definite; filaments of various lengths; anthers adnate, bursting inwards, sometimes very small, occasionally bursting outwards, sometimes 1-celled, and sometimes opening by a pore or transversely; even immersed in a fleshy receptacle. Disk fleshy, occasionally 5-lobed. Ovary solitary, superior, 1- or many-celled; ovules solitary, orthotropical or anatropal, (*Endl.*), erect, or ascending, or numerous and attached to central placenta; style none, or very short; stigma peltate, or radiate. Fruit either dry or succulent, 1- or many-celled, 1- or many-seeded, dehiscent or indehiscent. Seeds frequently nestling in pulp; their coat thin and membranous; always wingless; very frequently with an aril; albumen none; embryo straight; cotyledons thick, inseparable; radicle either turned to or from the hilum.

Their opposite coriaceous leaves, broken-whorled calyxes, equilateral petals, indefinite stamens, and sessile radiant stigmas, must be regarded as the main features of the *Guttifers*, to which may usually, though not always, be added the binary arrangement of their calyx and corolla. If these are neglected the Order merges in that of *Tutsans*. Dr. Wight has indeed proposed to send into that Order *Clusia* and all the other genera having the calyx and corolla arranged in fives; but to this proposition there are great objections; not the least of which must be the destruction of the precise character of both the Orders. The reader is, however, referred to that excellent Botanist's work above quoted, for an explanation of the reasons which have led him to this conclusion. It is not a little remarkable, that a strong tendency to the separation of sexes should be found among plants so high in the scale of organisation as these are.

Fig. CCLXXXII.—*Cambogia gutta*. 1 a ♀ flower, with the sterile stamens surrounding the pistil; 2. a ♂ flower; 3. an anther, which opens by throwing off a cap, in consequence of transverse dehiscence; 4. a transverse section of the ovary.



Cambesides remarks, that "Guttifers differ from Tiliaceæ in their leaves, their flowers, and their articulated peduncles; in the normal structure of the gynoecium of their flowers, which appears to be two- and not tri-lobed, instead of five-lobed as in Tiliaceæ; in their anthers united the whole length with the filament; and not articulated at its summit; in their seeds, which often have an aril, and are solitary in each cell of the ovary, a character found in no Tiliaceæ (the monospermous cells of the fruit of some *Viburnas* is due to abortion); finally, in the structure of the calyx, which is different in the two Orders. Tiliaceæ, moreover, have the carpels often nearly distinct. Marcgraviaceæ are distinguished by their alternate leaves, the singular form of their lower bracts, their petals frequently united, their unsymmetrical flowers, and by their seeds being very small, and exceedingly numerous." Royle remarks that Guttifers are in some respects allied to Eboriæ, as may be seen by comparing species of *Garcinia* with some kinds of *Diospyros*.

All natives of the tropics, the greater part of South America; a few are from Madagascar and the continent of Africa. They generally require situations combining excessive heat and humidity.

An acrid, purgative, yellow gum resin appears to be a very general secretion of the various species of this Order. In one of its forms it becomes the gamboge of commerce, a substance well known because of its use as a pigment, and as an active medicine dangerous in over-doses. The best gamboge comes in the form of pipes from Siam, and this is conjectured to be the produce of *Garcinia cochinchinensis*; another kind, in lumps, has been said to be derived from *Cambogia gutta*, called also *Hebradendron cambogioides*; but Dr. Wight's last experiments are not favourable to this supposition, and he expressly states that the tears of *Cambogia gutta* "are a substance altogether distinct from true gamboge." Roxburgh says he received frequent samples of the gamboge of his *Garcinia pictoria* from a correspondent at Tybeherry, and uniformly found it, even in the recent unrefined state, superior in colour, while recent, to any other kind he had tried, but not so permanent as that from China. Dr. Royle contradicts this statement: "The yellow juice, however, of *Xanthoxylum picturatus* is said to be of very inferior quality."

The seeds of *Coleophyllum polyphyllum* yield an oil, and a resin exudes from the leaves, which is supposed by some authors to be the same as the *Tacamahac* of the *Esquimaux* of Bourbon. The true *India Tacamahaca* is produced by *C. Odora*; and *Mogania* resin is referred to the same species. Martius states that *C. brasiliensis* yields an acrid aromatic lemon-scented resin. The Hog Gum tree of Jamaica is named by Dr. Bancroft to be a plant of this Order allied to *Ocrotocarpus* and *Garcinia*. The gum is a viscid substance, burning with a smoky and yielding an aromatic agreeable odour. (*Ann. Journ.* 4. 144.) Dr. Macbride asserts that this Hog gum is the same as the *gumi* or *gummi* of Brazil, and therefore belongs to *Meriania* or *Meriania*, in which he is wrong. It is largely used in the West Indies for the same purposes as pitch, and also in the form of pills, as a substitute for balsam of capivi. In India, as we have seen, under the Hog gum to *Clusia flava*. Balsam of Maria comes from *Veronica montana*, and a great many more furnish similar balsamic substances. In the West Indies the juice of *Manumea* is employed to destroy the chiggers or ticks, *Simulium*, little insects which attack the naked feet, irritating themselves with the fluid before the *Simulium*. The Butter and Tallow-tree of Sierra Leone, which bears the name (*Persea* or *Butyrospermum*) to the yellow greasy juice its fruit yields when cut, belongs to this Order. The flowers of *Clusia insignis* seep a considerable quantity of resin from the disk and



FIG. CCXXXIII.



stamens ; so much indeed, that Von Martius says he obtained an ounce from two flowers ; this resin, rubbed down with the butter of the Chocolate-nut, the Brazilian women employ to alleviate the pain of a sore breast. A few are cultivated for their timber. *Calophyllum angustifolium*, the Piney-tree, furnishes the straight spars called Peon at Penang, and in the islands to the eastward of the Bay of Bengal, and the Mesuas are said to have excessively hard timber. Of these last plants the root and bark are bitter and aromatic, and powerfully sudorific, their leaves mucilaginous, their unripe fruit aromatic, acrid, and purgative ; the blossoms of *Mesua ferrea* occur in the bazaars of India under the name of Nagkesur, being used in medicine and esteemed for their fragrance. Lastly, the fruit of many species acquires great excellence and is highly esteemed in tropical desserts. The Mammee Apple, or Wild Apricot of South America, is said to rival the Mangosteen : its seeds are anthelmintic ; its flowers yield, by distillation, a stomachic spirit called Eau de Créole : and a wine is obtained by fermenting its sap. The large berries of *Platonia insignis* (called Pacoury-uva in Brazil), are very sweet and delicious, while their seeds have the taste of Almonds. The Mangosteen itself, produced in the Straits of Malacca by *Garcinia Mangostana*, has the reputation of being the finest of all fruits ; it resembles a middle-sized Orange, and is filled with a sweet and most delightful pulp. It is generally thought that this tree will not thrive beyond the hot and damp atmosphere of Malacca : but Dr. Wight states that it has been introduced into the gardens of Courtalium, where it had already begun to bear in the year 1840. *Illust.* 1. 115. *Garcinia cornea*, *Kydiana* and *pedunculata* are mentioned as other species whose fruit is brought to table, but they are represented to be very inferior ; that of *G. pedunculata* is said to be the nearest approach to the Mangosteen.

#### GENERA.

<p>I.—CLUSIÆÆ.</p> <p><i>Tovomita</i>, Aubl.</p> <p><i>Marialva</i>, Vand.</p> <p><i>Marialvea</i>, Mart.</p> <p><i>Beauharnoisia</i>, Ruiz. et Pav.</p> <p><i>Micranthera</i>, Choisy.</p> <p><i>Bertolonia</i>, Spreng.</p> <p><i>Ochrocarpus</i>, Thouars.</p> <p><i>Chrysoclamys</i>, Pöpp.</p> <p><i>Verticillaria</i>, Ruiz et Pav.</p> <p><i>Chloromyron</i>, Pers.</p> <p><i>Havetia</i>, H. B. K.</p> <p><i>Renggeria</i>, Meisn.</p> <p><i>Schweiggeria</i>, Mart.</p> <p><i>Rengifia</i>, Pöpp.</p>	<p><i>Quapoya</i>, Aubl.</p> <p><i>Xanthé</i>, Schreb.</p> <p><i>Clusia</i>, Linn.</p> <p><i>Triplandron</i>, Benth.</p> <p><i>Arrudea</i>, St. Hil.</p> <p>II.—MORONOBÆÆ.</p> <p><i>Chrysopia</i>, Nuronh.</p> <p><i>Moronobea</i>, Aubl.</p> <p><i>Symphonia</i>, Linn. f.</p> <p><i>Blackstonia</i>, Scop.</p> <p><i>Ancuriscus</i>, Presl.</p> <p>III.—GARCINIEÆ.</p> <p><i>Mammea</i>, Linn.</p>	<p><i>Garcinia</i>, Linn.</p> <p><i>Mangostana</i>, Rumph.</p> <p><i>Oxyacarpus</i>, Lour.</p> <p><i>Brindonia</i>, Thouars.</p> <p><i>Xanthochymus</i>, Roxb.</p> <p><i>Stalagmitis</i>, Mun.</p> <p>? <i>Discostigma</i>, Hassk.</p> <p><i>Pentadesma</i>, R. Br.</p> <p><i>Cambogia</i>, L.</p> <p><i>Hebradendron</i>, Grah.</p> <p><i>Gynotroches</i>, Bl.</p> <p><i>Platonia</i>, Mart.</p> <p>IV.—CALOPHYLLÆÆ.</p> <p><i>Mesua</i>, Linn.</p>	<p><i>Rhyma</i>, Scop.</p> <p><i>Nagassarium</i>, Rumph.</p> <p><i>Calophyllum</i>, Linn.</p> <p><i>Bintagor</i>, Rumph.</p> <p><i>Calysaccion</i>, Wight.</p> <p><i>Kayea</i>, Wall.</p> <p><i>Apoterium</i>, Blum.</p> <p>? <i>Rheedia</i>, Linn.</p> <p><i>Van-Rheedia</i>, Plum.</p> <p>? <i>Stelechosperrum</i>, Blum.</p> <p>? <i>Macanea</i>, Juss.</p> <p><i>Macahanea</i>, Aubl.</p> <p>? <i>Macoubea</i>, Aubl.</p> <p>? <i>Souala</i>, Blanc.</p>
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NUMBERS. GEN. 30. Sp. 150.

*Ebenacæ.*

POSITION.—Hypericacæ.—CLUSIACEÆ.—Ternströmiacæ.

#### ADDITIONAL GENERA.

*Cochlanthera*, Choisy, near *Clusia*.  
*Androstylium*, Miquel, near *Quapoya*.

According to Dr. Hancock, Hog gum is not furnished by any plant of this order, but by *Rhus Metopium*. The resinous matter of *Clusia flava* and others has been described by Hamilton in the *Pharmaceutical Journal*. He says its properties do not appear to have been made the subject of investigation. The *Clusia flava* is known in Nevis by the names of Fat Pork, Monkey-apple, and Mountain or wild Mango ; in Jamaica by the name of the Balsam-tree ; and among the French by that of Figue Modique. In Nevis and St. Kitt's, two other species inhabit the mountain woods, namely, *C. alba* and *C. rosea*, both trees from twenty to thirty feet in height, to which the local names, already noticed, are indifferently applied, all of which yield a glutinous sap whose properties appear to resemble those of the *C. flava*, or yellow Balsam-tree. The glutinous sap of *Clusia alba* becomes red by exposure to the air, and, like the former, is employed by the Caribs for covering the bottom of their canoes in place of pitch.



## ORDER CXLV. MARGRAVIACEÆ.—MARGRAVIACEÆ.

Margraviaceæ, *Juss. Ann. Mus. 14, 167, 1800*. *Fl. Pers. 1, 600, 1804*. *Fl. Ind. 600, 1804*.  
*Miss. Gen. 44.*

DIAGNOSIS.—*Guttiferæ Euphorbiæ*, with simple alternate leaves without stipules, laminate cal flowers, equilateral petals, versatile anthers, sessile stigmas, and numerous minute seeds.

Trees or shrubs, sometimes climbing and rooting. Leaves alternate, simple, succous, entire, without stipules. Flowers regular, in umbels, racemes, or terminal spikes, usually furnished with bracts which are sometimes bag-shaped or hooded. Sepals from 2 to 7, usually coriaceous and imbricated. Corolla hypogynous; sometimes monopetalous, calyptriform, entire, or torn at the point; sometimes consisting of five imbricated petals. Stamens usually indefinite, inserted either on the receptacle or on a hypogynous membrane; filaments dilated at the base; anthers long, innate, 2-celled, bursting inwards. Ovary single, superior, usually furrowed, 3 or many-celled; style single; stigma simple or capitate; ovules numerous, attached to the projecting lobes of a central placenta, ascending, with the foramen downwards. Fruit supposed to be usually succulent; but also capsular, coriaceous, and consisting of several valves which separate slightly; dissepiments proceeding from the middle of the valves, but not meeting in the centre, so that the fruit becomes 1-celled. Seeds very minute and numerous, nestling in pulp, lob-long, blunt at each end, straight or incurved, with the outer skin hardish and netted, with a lateral hilum. Embryo without albumen, incurved, between club-shaped and cylindrical, with very short blunt styli-dons, and a long conical acute radicle, which is interior, contiguous to the hilum, and parallel with it.—*Endlicher.*]

The true station of this Order is not clearly made out. It approaches Flacourtiæ in its monopetalous corolla cut round at the base, in the anthers attached by their base, and the alternate leaves; Heathworts in the anthers and disk of the pistil; Aithææ in Turpins and Guttifers in the hypogynous stamens, the polypterus, mode of ovary, placenta, and numerous seeds; when the Jussieu stationed the order here, Clusia. And this view of the relationship of Margraviaceæ is generally accepted. Indeed, Endlicher says, that the species hardly differ from Guttifers except in their alternate leaves and versatile anthers. But we really know very little about them. Some of the genera are remarkable for the singular condition of their leaves, which assume the appearance of hoods, pouches, or spurs. Turpin has sometimes remarked, that such bracts offer a clear explanation of the conversion of a megasporangium into an ovule.

Fig. CCLXXXIV.—*Rapese* in anther. 1. Anther with a long and point. 2. Anther of the same. 3. A seed. 4. The same, with a portion of the testa torn open to show the embryo. [N. B. Figs. 3 and 4 are reversed in the cut.]





All the species occur in equinoctial America, except the doubtful genus *Antholoma*, which is a native of New Caledonia.

They are handsome and curious plants, remarkable for their singular cucullate bracts. The stem, root, and leaves of *Marcgravia umbellata* are regarded in the West Indies as diuretic and antisiphylitic.

GENERA.

<i>Ruyschia</i> , Jacq.	<i>Loghania</i> , Scop.	<i>Ascium</i> , Schreb.	<i>Marcgravia</i> , Plum.
<i>Souroubea</i> , Aubl.	<i>Norantea</i> , Aubl.	<i>Schwarzia</i> , Fl. Flum.	? <i>Antholoma</i> , Labill.
<i>Surubea</i> , Mey.			

NUMBERS. GEN. 4. Sp. 26.

*Ebenaceæ.*

POSITION.—*Clusiaceæ*.—MARCRAVIACEÆ.—*Hypericaceæ*?



## ORDER CXLVI. HYPERICACEÆ.—TUTANS.

*Hypericon*, *Juss. Gen.* 2:4 (1789).—*Hypericaceæ*, *Cham. Prodr. Hym.* 12 (1801). DC. *Prodr.* 2: 36 (1824). *Endl. Gen. exsicc.* *Miscov.* *Gen.* p. 44. *Wright Journ.* 1: 36, under *Hypericon*. *Reich. Bot.* 2: 1: 167, 349. *Hypericaceæ*, *Lat. Pr. Nat. Hyperophorum*, *Endl.* *Bot.* in gen.

**DIAGNOSIS.** *Guttiferal Euphoras*, with oblique glandular patches, numerous stalked glands, and long distinct styles.

Herbaceous, or even occasionally annual, plants, shrubby, or trees, having a resinous juice, and often with angular branches. Leaves opposite, entire, without stipules, occasionally alternate, sometimes crenelled, usually impressed with transparent dots, and bordered with black glands. Flowers in most instances yellow, sometimes red or white, regular, with various forms of inflorescence. Sepals 4 or 5, free from the ovary, persistent, so arranged as to have two exterior to the others, separate or partially united. Petals of the same number as the sepals, unequal sided, twisted spirally in aestivation, bordered with black dots, sometimes having a fleshy scale or a hollow at their base.



FIG. CCLXXXV

Stamens hypogynous, almost always 00, sometimes distinct, occasionally somewhat fused, but almost always polyadelphous; sometimes having fleshy glands interposed between the bundles of stamens; filaments filiform; anthers 2-celled, opening lengthwise, frequently surmounted by a gland. Carpels 3 to 5, partially united round a glomerum, which forms the axis, and introduces its arms into their cavity; styles as many as the carpels, usually distinct, but occasionally cohering at the base; stigma capitate or truncate, rarely 2-lobed; ovules 00, (rarely definite,) generally horizontal, rarely ascending, occasionally pendulous, anatropal, or, in some instances, amphitropal. Fruit sometimes 1-celled, but in most instances either a dry or fleshy capsule, of many valves and many cells; the edges of the former being curved inwards. Seeds minute, usually spirally attached to a placenta in the axis, or adhering to the inner edge of the dissepiment; embryo straight or curved, with an inferior radicle and no albumen.

The unequal-sided petals, and dark glands upon their edge, often at once convey a ready means of recognising this Order, which moreover commonly possesses polyadelphous stamens. Its long styles, and distinctly apocarpous fruit, afford a further means of recognition. Keeping these characters in view, no doubt can be entertained of the true genera *Eueryphia* and *Carpodonto*, separated by Mr. Endlicher, being genuine members of the Order of Tutans; for the inequality of the petals is distinctly visible in the latter genus. Nor does it appear desirable to separate from the Tutans the section *Stenos*.

FIG. CCLXXXV.—*Hypericum floribundum*. 1. A flowering branch; 2. A flower dissected; 3. A pistil with 3 carpels; 4. A seed laid horizontally and cut through to show the embryo and radicle; 5. A piece of a leaf with transparent dots.



*Parnassia*, whose fringed glands can scarcely be doubted to represent phalanges of sterile stamens, and consequently, indicate a tendency to the production of an indefinite number of polyadelphous stamens, which is one of the characteristics of *Tutsans*. If indeed the seeds of *Parnassia* were really parietal, as they are described to be, that would be a reason for removing it to some other place: but its exalbuminous seeds forbid its being stationed among Sundews, and it has nothing in common with *Saxifragas* except its habit. I believe, however, that in *Parnassia*, as in *Hypericum*, the placentæ are truly axile and projected into the cavities of the ovary, which closes over them and adheres to them; and it is certain that the petals are in some species very unequal-sided, while the anthers of others are tipped by the glands of *Tutsans*, and the petals themselves, if they have not projecting glands possess immersed glands, in no inconsiderable quantity.

*Tutsans* are very generally spread over the surface of the earth, inhabiting mountains and valleys, marshes and dry plains, meadows and heaths. The following is the distribution of the species, according to Choisy:—Europe, 19; North America, 41; South America, 21; West Indies, 1; Asia, 24; New Holland, 5; Africa and the neighbouring islands, 7; Azores and Canaries, 5; common to Europe and Asia, 4; common to Europe, Asia, and Africa, 1.—*Choisy Prodr.* 1821. Many have, however, to be added for Asia and South America.

The juice of many is slightly purgative and febrifugal. In the European species this yellow juice is in small proportion to the essential oil, and the rest of the vegetable matter, and they have been used as tonics and astringents; especially *H. perforatum*, (ασκυρον,) and *Androsæmum officinale*. Some of the American species are possessed of a more copious yellow juice, and more energetic properties; that obtained from *Vismia guianensis*, a Mexican and Surinam tree, is known in commerce and called American Gummi Gutta. So also the *Vismias micrantha* and *laccifera* yield red sticks of a drastic gum-resin analogous to gamboge.—*Martius*. *Hypericum hircinum* is fœtid. A gargle for sore throats is prepared in Brazil from the *Hypericum connatum*, commonly called *Orelha de Gato*. A decoction of the leaves of another species, *Hypericum laxiusculum*, or *Allecrim brabo*, is reputed in the same country to be a specific against the bites of serpents. The United States people prepare a stomachic tincture from *Elodea virginica*. *Cratoxylon Hornschuchia* is slightly astringent and diuretic.

#### GENERA.

##### I. HYPERICÆÆ. — No glands between the stamens.

##### *Ascyrum*, Linn.

##### *Isophyllum*, Spach.

##### *Hypericum*, Linn.

##### *Eremosporus*, Spach.

##### *Drosanthe*, Spach.

##### *Webbia*, Spach.

##### *Holosepalum*, Spach.

##### *Milleporum*, Spach.

##### *Adenosepalum*, Spach.

##### *Drosocarpium*, Spach.

##### *Coridium*, Spach.

##### *Crossophyllum*, Spach.

##### *Olympia*, Spach.

##### *Campylopus*, Spach.

##### *Psorophyllum*, Spach.

##### *Androsæmum*, Allion.

##### *Eremanthe*, Spach.

##### *Campyloporus*, Spach.

##### *Norysea*, Spach.

##### *Roscyna*, Spach.

##### *Myriandra*, Spach.

##### *Brathyidium*, Spach.

##### *Brathys*, Mut.

##### *Receveura*, Fl. Flum.

##### *Sarothra*, Linn.

##### *Eucryphia*, Cav.

##### *Carpodontos*, Lab.

##### II. ELODEÆÆ. — Glands alternating with the bundles of stamens.

##### *Parnassia*, L.

##### *Elodea*, Adans.

##### *Martia*, Spreng.

##### *Triadenia*, Spach.

##### *Vismia*, Velloz.

##### *Coapia*, Piso.

##### *Psorospermum*, Spach.

##### *Haronga*, Thouars.

##### *Arongana*, Lam.

##### *Arongana*, Pers.

##### *Hæmocarpus*, Noronh.

##### *Eliæa*, Cambess.

##### *Cussonia*, Commers.

##### *Lanigerostemma*, Chpl.

##### *Ancistrolobus*, Spach.

##### *Tridesmis*, Spach.

##### *Cratoxylon*, Blum.

##### *Hornschuchia*, Blum.

NUMBERS. GEN. 13. Sp. 276.

#### *Saxifragaceæ.*

POSITION.—*Clusiaceæ.*—*HYPERICACEÆ.*—*Reaumuriaceæ.*

#### ADDITIONAL GENERA.

*Thymopsis*, Joub. } next *Hypericum*.  
*Adenotrias*, Joub. }  
*Aerosanthus*, Presl. = *Vismia*.



## ORDER CXLVII. REAUMURIACEÆ.—REAUMURIACEÆ.

Reaumuria, *Flor. Ind. M.*, No. 14, 78, 1807. — *Thammaria*, *Fl. Ind. M.*, No. 14, 78, 1807. — *Myrica*, p. 129.

DIAGNOSIS.—*Guttiferæ* *Indica*, with *calyx glandular petali*, a few *slimy* seeds, and long *distinct* style.

Small shrubs with fleshy seed-like leaves, which are alternate, have no stipules, and are overspread by resinous salt glands. Calyx 5-parted, surrounded externally by imbricated bracts. Petals 5, hypogynous, unequal-sided, sometimes having a pair of membranous plates planted upon their middle. Stamens definite or indefinite, hypogynous, monadelphous or polyadelphous, with or without a hypogynous disk; anthers ovate, turned inwards, and bursting longitudinally. Carpels free, 2-4-5, partially separate from each other, surrounding a central placenta which passes into the base of each; ovules 2 or 4, ascending, anatropal; styles filiform, or subulate. Fruit capsular, with 2 to 5 valves and as many cells, unless the number is diminished by abortion. Seeds shaggy, definite, erect; embryo straight, surrounded by a small quantity of mealy albumen; radicle next the hilum.

Ehrenberg suggested (Cat. des Sc. 12, 76.) that *Reaumuria* and *Hololaelma* might constitute a little group, to be called *Reaumuriacæ*. At that time the true relations of plants were ill understood, and if he had referred the genera he knew to Tutsons, he would never have had his opinion called in question. In fact there is nothing to distinguish these Orders except that *Reaumuriads* have shaggy seeds, and appendages at the base of the petals, which appear to be destitute of glands. They have no affinity with *Ericæ* or *Lauræ*.

Natives of the coast of the Mediterranean and the salt plains in the colder parts of northern Asia.

It seems that these plants abound in saline matter, a circumstance that is deduced from the situations in which they grow. *Reaumuria vermiculata* is used at Alexandria as a cure for itch. Its bruised leaves are applied externally, and a decoction is administered internally.

## GENERA.

*Hololaelma*, Ehrenb.

*Reaumuria*, Thunb.

*Thammaria*, Thunb.

NUMBERS. GEN. 5. Sp. 4.

POSITION.—Hypericaceæ.—REAUMURIACEÆ.

FIG. CCEXXXVI. *Reaumuria hypericoides*. 1. a branch with its leaves; 2. the flower dissected particularly; 3. a petal; 4. capsule; 5. seed dissected perpendicularly and from beneath; 6. *Hololaelma*.



## ALLIANCE XXXI. NYMPHALES.—THE NYMPHAL ALLIANCE.

DIAGNOSIS.—*Hypogynous Exogens, with dichlamydeous flowers, axile or sutural placenta, 00 stamens, and an embryo on the outside of a large quantity of albumen; or, if exalbuminous, the seeds have a very large plumule.*

The singular fact of the embryo lying on the outside of a large mass of albumen would enable the Botanist to distinguish Nymphals with certainty from all those Orders with which they are here associated, if it were not for the Waterbeans, which appear to have no albumen at all. With them, however, it would seem as if an enormous plumule compensated for the absence of this substance. The species are among the most highly developed of any in the vegetable kingdom, if we only regard their flowers; but the total absence of a woody stem places them, on the other hand, among less noble allies. They differ from the Ranal Alliance principally in their embryo, and seem to run close upon the Crowfoots themselves, through both the Waterbeans and Watershields. They have no obvious alliance with any part of Guttiferales, except Guttifers themselves; but they touch the Ranal Alliance at every point.

The stamens are often attached to the sides of the ovary, and are even not liberated in some cases till the very summit of it; but this seems a mere modification of the hypogynous structure.

## NATURAL ORDERS OF NYMPHALS.

- Carpels united into a many-celled fruit, with dissepimental placenta.* 148. NYMPHÆACEÆ.  
*Carpels distinct. Albumen copious. Torus absent.* . . . . 149. CABOMBACEÆ.  
*Carpels distinct. Albumen 0. Torus honey-combed, very large.* . 150. NELUMBIACEÆ.

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Consult a long memoir on the structure of the axis of Nymphæaceæ, by Trécul, in *Ann. Sc. 3. ser. IV.* 286.



ORDER CXLVIII. NYMPHAEACEAE.—WATERLILIES.

NYMPHAEACEAE, *Syll. bot.*, *Ann. bot.* 2, p. 49, 1830. *Bot. Prodr. Ind. ad.* 2, p. 441, 1831. *Ann. bot.* 3, p. 441, 1832. *Prodr.* 1, 113, 1834. *Wright's Fl. Ind. ad.* 2, p. 241. *Ann. bot.* 3, p. 441, 1832. *Ann. bot.* 6.

DIAGNOSIS.—*Nymphaeaceae*, with a many-celled fruit and dissepimental placentae.

Herbs, with peltate or cordate fleshy leaves, arising from a prostrate trunk, growing in quiet waters. Flowers large, showy, often sweet-scented. Sepals usually 4, free, rarely adherent; petals numerous, imbricated, often passing gradually out of the last into stamens; the former persistent, the latter deciduous, and inserted upon the disk, sometimes forming a monopetalous corolla. Stamens numerous, inserted above the petals into the disk, filaments petaloid; anthers adnate, bursting inwards by a double longitudinal cleft. Disk large, fleshy, surrounding the ovary more or less. Ovary polyspermous, many-celled, with radiating stigmas, alternate with the dissepiments; ovules numerous, anatropal, attached to the sides of the dissepiments. Fruit many-celled, indehiscent. Seeds very numerous, attached to spongy dissepiments. Albumen farinaceous. Embryo small, on the outside of the base of the farinaceous albumen, inclosed in a fleshy vitellus; cotyledons fleshy, concave; plumule oblique.

The opinions of Botanists are divided concerning the true nature of the structure of these beautiful plants, and consequently as to their proper station in a Natural System. This has been caused by some peculiarities in the embryo on the one hand, and by the want of any resemblance in the internal condition of the stem and that of Exogens. Richard supposed the vitellus, or more correctly, in which the embryo is inclosed, to be a cotyledon, and having a two-folied plumule; and hence the Order was referred to Endogens, or Monocotyledons, and placed in the vicinity of Hydrocharads. But it is now well known that Richard's cotyledon is a vitellus, analogous to that of Peppers, Gingers, and others; and that what Richard and his followers denominated plumule, is a 2-folied embryo, whence the Order is more generally placed in Exogens, or Dicotyledons. Even Van Marten, who once adhered to the opinion that Waterlilies are monocotyledons, and closely related to Hydrocharads, (see *Hortus Regius Middelburgi*, p. 25,) has placed the Order near Crowfoots (see *Conspectus*, No. 165). Those who are anxious to examine the different opinions on this subject are referred to *De Cuvier's Mémoires*, in the first volume of the Transactions of the Physical and Natural History Society of Geneva.



FIG. CCLXXXVII.—*Nymphaea odorata*. 1. A longitudinal section of a seed of *N. odorata*, showing the great plumule (ptg) on the inside of the vitellus.



It seems, however, desirable to state, in this place, what the reasons are which have led so many modern Botanists to place the Order in the class of Exogens. If the rhizome of *Nymphæa* is examined it will be found to consist principally of cellular tissue, with a very confused distribution of fibrovascular bundles among it, not at all like that of Exogens, but more resembling what occurs in succulent Endogens. But, according to Mirbel's examination of the anatomy of the roots of *Nuphar luteum*, in the *Annales du Museum*, vol. 16, pl. 20, the bundles of fibres are there placed in a concentric circle, the youngest being outermost. Secondly, the leaves are those of Dicotyledons, and so is their convolute vernation, which is not known in Monocotyledons, together with their insertion and distinct articulation with the stem. Thirdly, the flowers of Waterlilies have so great an analogy generally with Dicotyledons, and particularly with those of Magnoliads, and their fruit with Poppyworts, that it is difficult to doubt their belonging to the same group.

It is not possible to refuse assent to the importance of some, at least, of these considerations; but I do not think that they quite dispose of the question as to where, in a Natural System, *Nymphæa* and its allies are to be placed. To the foliage little value can be assigned, for it is sufficiently like that of *Hydrocharis*. Nor does the structure of the root of *Nuphar* prove the stem to be an anomalous form of Exogens; for the circle of fibrovascular bundles found there is the common character of the roots of Endogens, as Schleiden first pointed out, and has no resemblance to that of Exogens. The argument derived from internal structure is therefore more in favour of Waterlilies being Endogens than Exogens. The true ground for considering them Exogens is certainly confined to the two-lobed embryo. It seems to have been forgotten that when Brown and Brongniart proved Richard's cotyledon to be nothing more than the amniotic sac, they did not also prove, as a necessary consequence, that the so-called plumule of Richard was a dicotyledonous embryo. It may be monocotyledonous, notwithstanding its vitellus. Certainly its two lobes are very like those of Exogens; but I find that in *Nymphæa alba* the lobes are not suddenly contracted at their base like true cotyledons, (nor are they in *Nelumbium*), and, moreover, that the plumula is, in that plant, placed in an oblique direction with respect to the lobes; so that, in fact, the embryo of *Nymphæa* is much like a modification of such monocotyledonous embryos as those of *Aponogeton*, *Cymodocea*, and *Posidonia*.—See *Ann. Sc. n. s.* xi. t. 17. Indeed, I perceive no reason why it should not be regarded as having one split cotyledon, rather than two distinct ones. The principal mass of the nucleus in the seeds of Orchids appears from the researches of Professor Link to be an analogous case. In these plants the nucleus is a spheroidal cotyledon, from whose surface the radicle and plumule respectively protrude. We have only to imagine it elevated on each side, and we should have the two-lobed body of this Order. For the present, however, I am not prepared to disturb existing arrangements; though I much suspect that it

will be done by some other Botanist. Indeed M. Ad. Brongniart has lately declared that the position of Waterlilies appears to him very doubtful.—*Enumeration* xxv. De Candolle assigns as a further reason for considering Waterlilies to be Dicotyledons, that they are lactescent, a property not known in Monocotyledons. But in this he is mistaken; *Limncharis*, a genus belonging to Butomads is lactescent. Finally, Mr. Hassal appeals to the condition of the pollen of Waterlilies, which he thinks proves them to be undoubted Monocotyledons. The pollen grain of *Nymphæa* is described by this observer as being oval, hispid, with a furrow down one side, and emitting a single pollen tube, which marks he regards as characteristic of Endogens.

The germination of *Nymphæa alba* is not exactly either exogenous or endogenous. The radicle is clearly endorhizal, as in the latter; but the cotyledons lengthen their bases to allow the plumule to escape, just as in an acorn; and this is perhaps one of the strongest arguments in favour of the lobes of the embryo being really cotyledons.

Supposing this Order to be exogenous and dicotyledonous, its immediate affinity will be with Poppyworts, with some genera of which it agrees in the very compound nature of the fruit, from the apex of which the sessile stigmas radiate, in the presence of narcotic principles and a milky secretion, and in the great breadth of the placenta. Waterlilies are also considered akin to Magnoliads, with which they agree

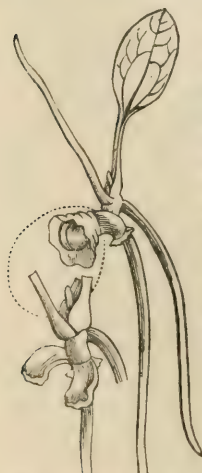


Fig. CCLXXXVII. bis.



in the imbricated nature of the petals, sepals, and stamens: in *W. arborescens* this peculiarity is evident; with *C. crinita* they are connected through the tube of the corolla, with which they agree in the dilated state of the dilata, which is true in *Impatiens*, *Physalis*, *Mimulus*, frequently rises as high as the top of the corolla, and in the southern members of their hypericaceous stements; but in *C. crinita* is the pistil the only organ *the axis* of each of the carpels of which the fruit is made up: so that in *Neptunia* is which the carpels adhere in the centre, the seeds are attached to the axis, while in *W. arborescens* the placentae occupy the whole surface of each side of the individual carpels, of which the fruit is composed.

On the other hand, if we consider *W. aculeata* as a part of the *Leptogonum* group, we shall be at no loss to find strong affinities with them in that section, as for example, with *Hydrocharads*, and more particularly with the *Alismal* Alliance, whose *Leptogonum* carpels, habit, and peculiar placentation, are very important points of similarity.

Independently of the circumstances to which allusion has just been made, the Ovary is remarkable in some other respects. It offers one of the best examples which can be added of the gradual passage of petals into stamens, and of sepals into pedicels. If attentively examined, the transition will be found so insensible that many intermediate bodies will be seen to be neither precisely petals nor stamens, but both in part. The development of the torus, which is so remarkable in Waterbeens, is here represented by a similar enlargement of the disk, which in some, as in *Nuphar*, is merely a hypanthium, out of which grow the stamens and petals; in others, as *Nymphaea*, elevates itself as high as the top of the ovary, to the surface of which it is adnate, and as the stamens are carried up along with it, we have these organs apparently proceeding from the surface of the ovary; in the genus *Barringtonia*, the petals are also carried up with the stamens, on the outside of which they even adhere into a tube, so that in this genus we have a singular instance of an inferior calyx and a superior corolla in the same plant. In *Victoria* the sepals are also adnate to this disk, and thus a tubular receptacle for the ovary is produced. In *Nymphaea alba*, the seeds are inclosed in a true arillus; but M. Planchon (*Mém. sur les Arctées*, p. 135) has shown that no such integument exists in *Nuphar luteum*.

Floating plants, inhabiting the whole of the northern hemisphere, but generally rare in the southern hemisphere, on the continent of South America they are represented by *Victoria*.

This Order has the reputation of being antiaphrodisiac, sedative, and having other properties not very clearly made out, but generally credited. Dr. W. has, however, well observed that these are quite imaginary qualities, assumed to exist in consequence of the habitation of Water-lilies "in the midst of cool and placid waters, surrounded with the elastic whiteness of their flowers." The Fucus propriety a cooling effect upon the flowers of *Nuphar luteum*, which they call *Pufer ciegli*. Their stems are mucous, cooling, and astringent, for which reason they have been prescribed in dysentery. They contain a considerable quantity of starch, and after repeated washings, are capable of being used for food without danger. The seeds are eagerly sought after in times of scarcity by the wild people in whose countries they grow. They taste like Poppy-seeds, and are used either boiled or raw like Millet. Victoria, the most glaucous and beautiful of water plants, is said to be on that account called Water Mallow in some Asiatic languages. The seeds are in like manner a favourite food among the Indians and Chinese. The great quantity of starch contained in them accounts for this. The rhizomes and tubers of *Nymphaea* are esteemed by the negroes of Senegal, who are said to roast and eat them like Potatoes. In India the farinaceous seeds are eaten either in a stew, or after having been roasted in heated sand. It is said by L. that the yellow seeds of *Nymphaea alba* are better than Oak-galls for dyeing gray; they are also very frequently employed advantageously for tanning leather; and a kind of ink is made and has been prepared from them. The leaves of *Nuphar luteum* are reported to be very good for the

## GENERAL

Tribe 1. Euryandae — <i>Tubular, the calyx persistent to the disk. Petals distinct.</i>	Tribe 2. Nupharandae — <i>Clay-like, petals fused into disk.</i>	Tribe 3. Nymphaeandae — <i>Clay-like, petals fused into disk.</i>
Euryandae, Scitg. Cassiope, Andr. Victoria, Lindl.	Nupharandae, Scitg. Cassiope, Andr. Victoria, Lindl.	Nymphaeandae, Scitg. Cassiope, Andr. Victoria, Lindl.

NUMBERS, GEN. 2. 50. 50

1903

Postmon. = Calamagrostis = Nardus = Nardus.

1



## ORDER CXLIX. CABOMBACEÆ.—WATERSHIELDS.

Cabombaceæ, *Torrey and Gray*, 1. 54. (1838).—Cabombæ, *Rich. Anal. Fr.* (1808); *Endl. Gen. clxxxvi*—Podophyllaceæ, § Hydropeltideæ, *DC. Syst.* 2. 36. (1821); *Prodr.* 1. 112. (1824).—Hydropeltideæ, *Schleid. in Wieg. Arch.* 5. 230.

DIAGNOSIS.—*Nymphal Exogens*, with distinct carpels, abundant albumen, and no visible torus.

Aquatic plants, with floating peltate leaves. Flowers axillary, solitary, yellow, or purple. Sepals 3 or 4, coloured inside. Petals 3 or 4, alternate with the sepals. Stamens definite or indefinite, hypogynous, arising from an obscure torus; anthers linear, turned inwards, continuous with the filament. Carpels 2 or more, terminated by a short style. Ovules orthotropical, pendulous. Fruit indehiscent, tipped by the hardened style. Seeds definite, pendulous; embryo minute, two-lobed, inclosed in the fleshy sac of the amnios, at the apex of the nucleus, and external to an abundant fleshy albumen.

There can be no doubt about the near relationship of these plants to Waterlilies, with which they correspond in having a minute embryo inclosed in a vitellus, and from which they only differ in having disunited carpels, and a very small number of sutural ovules. From Waterbeans, with which they correspond in their disunited carpels, they are distinguished by their abundant albumen, minute embryo, nearly total want of torus, and having more seeds

than one in each carpel. Their relationship to Podophyls is much more remote, nor can they belong to the same Alliance, although they have been combined with that Order by De Candolle. Richard, who regarded Waterlilies as Monocotyledons, referred these plants also to that great class; but he misunderstood the structure of their embryo, which has been well illustrated by

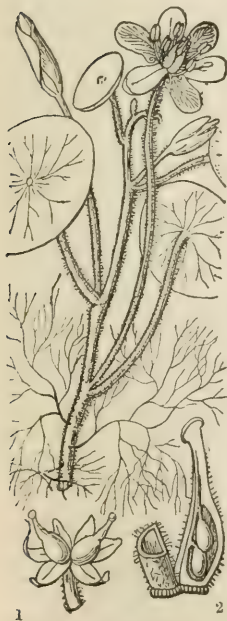


Fig. CCLXXXVIII.

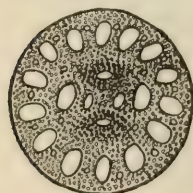
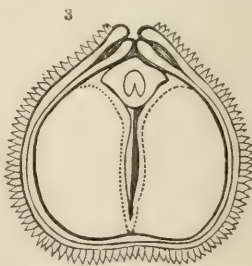


Fig. CCLXXXIX.

Schleiden. Nuttall describes the young leaves and flowers, together with the other parts exposed to the air, to be covered "with an inconspicuous flocculent pubescence, immersed in a gelatinous substance." This Schleiden states to be a remarkable state of the epidermis, which consists of a very thick layer of well-defined insoluble gelatine, in which the cells of the epidermis are introduced.—*Wieg.* 5. 230. The same author says, that not a trace of spiral vessels can be found in any of the submersed parts. I find the stem to consist of a mass of small cellular tissue surrounding 15 or 16 large air-tubes, and some smaller ones, in the centre of which is a pair of woody bundles, crescent-shaped in their transverse section, with the convexity directed inwards. These bundles consist of thin-walled elongated tissue, in the middle of which is a solitary tube of larger size, apparently also an air-tube, for I can find no trace of spiral structure in it.

Fig. CCLXXXVIII.—*Cabomba aquatica*. 1. the pistil and calyx; 2. sections of the carpels (*Turpinia*); 3. a section of its seed.—*Schleiden*.

Fig. CCLXXXIX.—Section of the stem of *Hydropeltis purpurea*.



AMERICAN water plants, found from Cayenne to New Jersey and also on the coast of New Holland, beyond the tropics, according to P. Hackel.

*Hydropeltis purpurea* is said to be nutritious, but slightly astringent. The leaves are employed as a remedy for phthisis and dysentery.

GENERA.

- Cabomba*, Ait.
- Najas*, Swartz.
- Hydropeltis*, Walt.
- Limnoria*, Pursh.
- Roscoelinea*, Bosc.

NUMBERS. GEN. 2. Sp. 3.

*Roscoelinea*.

POSITION.—Nymphaeaceæ. CABOMBACEÆ. —Nelumbaceæ.



## ORDER CL. NELUMBIACEÆ.—WATER BEANS.

Nymphæacæ, § Nelumboneæ, DC. *Syst.* 2. 43. (1821); *Prodr.* 1. 113. (1824)—Nelumboneæ, *Martius* *Conspicius*, No. 187. (1834); *Endl. Gen.* clxxxix.—Nelumbiaceæ, *Ed. Pr. Wight Illustr.* i. t. 9.

DIAGNOSIS.—*Nymphal Exogens*, with distinct carpels immersed in a large honeycombed torus, and without albumen.

Herbs, with peltate, fleshy, floating leaves arising from a prostrate trunk, growing in quiet waters. [The rhizome growing at the point, with bundles of vessels forming a net-like cylinder, from whose outer and inner part bundles pass to the leaves and lateral flowers.—*Unger.*] Sepals 4 or 5. Petals numerous, oblong, in many rows, arising from without the base of the torus. Stamens numerous, arising from within the petals, in several rows; filaments petaloid; anthers adnate, bursting inwards by a double longitudinal cleft. Torus fleshy, elevated, excessively enlarged, inclosing in hollows of its substance the carpels, which are numerous, one-seeded, with a very short style and simple stigma. Ovule single, suspended from the point of a cord rising from the base of the cavity, anatropal. Nuts numerous, half buried in the hollows of the torus, in which they are, finally, loose. Seeds solitary, rarely 2; albumen none; embryo large, with two fleshy cotyledons and a highly developed plumule, inclosed in its proper membrane.

This beautiful race of water plants offers one of the most striking exceptions to the usual

importance of albumen as a general mark of affinity; for, although undoubtedly a member of the *Nymphal Alliance*, it has not a trace of albumen. Its cotyledons, however, are crammed with starch, and it has a plumule so completely organised, that it is ready to perform all the functions of growth the instant that germination is excited, and thus that necessity for a separate magazine of food, which is so great with the feeble *Nymphaeaceæ* embryo, does not here exist. The nature of what is here called the proper membrane of the plumule is not explained by Botanists. Richard regarded it as a cotyledon, the apparent cotyledons being in his view a two-lobed radicle. Ad. Brongniart refers it to the sac of the amnios, which seems inadmissible. De Candolle regarded it as a stipule; but it is found in connection only with the first leaf of the plumule, while, if De Candolle is right, it ought to be present at the base of the second leaf also. The singular enlargement of the torus, which constitutes so striking a feature in these plants, is probably a less important circumstance than their large exalbuminous embryo.

Natives of stagnant or quiet waters in the temperate and tropical regions of the northern hemisphere, both in the Old and the New World; most abundant in the East Indies. They were formerly common in Egypt, but are now extinct in that country, according to Delile.

Chiefly remarkable for the beauty of the flowers. The fruit of *Nelumbium speciosum* is believed to have been the Egyptian Bean of Pythagoras, and the flower that Mythic Lotus, which so often occurs on the monuments of Egypt and India. The nuts of all the species are eatable and wholesome. The root, or more properly the creeping stem,



Fig. CCXC.

Fig. CCXC.—*Nelumbium speciosum*. 1. a section of its young carpel; 2. a section of the same when ripened into a bean, and showing the structure of the seed.



is used as food in China. Dr. Roxburgh relates that the tender stems of the roots (rustaceous), between the joints, are eaten by the natives of India, either simply boiled or in their curries. The roots are eaten raw, roasted, or baked. Kirtul claims that the tubers of *Neelumbica* inferri resemble those of the Sweet Potato, are not becoming and agreeable when boiled, and are used for food by the American Indians. Kirtul also says that the milky viscid juice of the leaves and flower-stalks is employed as a remedy against sickness and diarrhoea, and that the pods, which smell as *Amorpha* flowers, are slightly astringent and used like Rose flowers. Dr. Wright informs us that the leaf and flower-stalks abound in spiral vessels, which are carefully extracted in India and formed into those wicks "which on great and solemn occasions are burnt in the lamps of the Hindoos placed before the shrines of their gods." Similar wicks are prepared from some *Nymphaeas*, but are not considered so sacred.

GENUS.

- Neelumbica*, Jacq.
- Neelumbica*, Gaertn.
- Neelumbica*, Swartz.

NUMBERS. Gen. 1. Sp. 3, at least.

POSITION.—*Nymphaeaceæ*.—*NEELUMBACEÆ*.—*Cabombaceæ*.



## ALLIANCE XXXII. RANALES.—THE RANAL ALLIANCE.

DIAGNOSIS.—*Hypogynous Exogens, with monodichlamydeous flowers, sutural or axile placentæ, 00 stamens, and a minute embryo inclosed in a large quantity of fleshy or horny albumen.*

Under this name are collected some of the most common, and at the same time the most highly developed species of the Vegetable Kingdom. In general they are characterised by the presence of a distinct calyx and corolla; but it is by no means uncommon to find these organs so blended together as to be undistinguishable, while in other instances the corolla is wholly wanting, and it even occurs occasionally that neither one nor the other is present. In appearance Ranals are singularly different even in the same Order; as, for example, in the Crowfoots, under which arrange themselves the common Crowfoot, the Aconite, *Thalictrum*, and *Xanthorrhiza*. But although there is so much diversity of appearance among them, nevertheless they certainly form a well compacted group, no one member of which can be spared, as will be seen by examining the remarks made under each Order. In general they have an indefinite number of stamens, but the genus *Bocagea* presents a very remarkable exception to that rule. They pass into the Berberal Alliance by the Poppyworts, some of which resemble *Sarraceniads*, and others the common forms of the Crowfoot Order. A clear case of transition to the Erical Alliance also seems to be established by the genus *Saurauja*, which to the disunited styles of Ranals and their indefinite stamens, adds the minute indefinite seeds, porous anthers, and monopetalous corolla of Heathworts themselves; that genus may be regarded as a *Clethra*, with the indefinite stamens of *Tetracera*, or as a *Tetracera* with the monopetalous corolla, minute seeds, and porous anthers of a *Clethra*. To Umbellifers in the Epigynous series they pass by way of their genus *Thalictrum*, whose whole habit is that of the former Order, and whose fruit would, if it adhered to the calyx, be nearly that of an Umbellifer.

## NATURAL ORDERS OF RANALES.

- |   |                      |
|---|----------------------|
| <i>Carpels distinct. Stipules large, convolute. Corolla imbricated.</i> | } 151. MAGNOLIACEÆ.  |
| <i>Albumen homogeneous . . . . .</i>                                    |                      |
| <i>Carpels distinct. Stipules 0. Corolla valvate. Albumen ruminat.</i>  | 152. ANONACEÆ.       |
| <i>Carpels distinct. Stipules 0. Corolla imbricated. Albumen</i>        | } 153. DILLENIACEÆ.  |
| <i>homogeneous. Seeds arillate . . . . .</i>                            |                      |
| <i>Carpels distinct. Stipules 0. Corolla imbricated. Albumen</i>        | } 154. RANUNCULACEÆ. |
| <i>homogeneous. Seeds without an aril . . . . .</i>                     |                      |
| <i>Carpels consolidated. Calyx permanent. (Placentæ axile).</i>         | 155. SARRACENIACEÆ.  |
| <i>Carpels consolidated. Calyx deciduous. (Placentæ usually</i>         | } 156. PAPAVERACEÆ.  |
| <i>parietal) . . . . .</i>  |                      |



## ORDER CII. MAGNOLIACEÆ — MAGNOLIAIDÆ.

Macleod, *Jour. Gard.* 250. 1780. — Magnoliaceæ, *DC. Syst.* 3. 400. 1813. *Flora* 1. 77. 1820. *Flora*  
*PL. Ind.* 1. 643. 1848. *Magnoliaceæ*, *DC. Syst.* 3. 400. 1813. *Flora* 1. 77. 1820. *Flora*  
*PL. Ind.* 1. 643. 1848. *Magnoliaceæ*, *DC. Syst.* 3. 400. 1813. *Flora* 1. 77. 1820. *Flora*

DIAGNOSIS. — *Rarely* *Fraxinæ*, with distinct carpels, (usually) large, succulent, fleshy, or  
 suberect, smooth, and *Avicenniæ* affinis.

Fine trees or shrubs. Scales of the leafband formed of stipules either placed free or  
 free or rolled up. Leaves alternate, sometimes with pellucid dots, coriaceous, sometimes  
 rolled distinctly with the stem; usually with deciduous stipules which, when young,  
 are rolled together like those of  
 Ficus, and mark the branches with  
 ringed scars where they fall off.  
 Flowers solitary, often strongly  
 candeliform, usually  $\frac{1}{2}$ , but in  
 Tasmania  $\frac{1}{2}$  -  $\frac{1}{4}$ . Trochodend-  
 ron has neither calyx nor corolla.  
 Sepals 5-6 (rarely 2-4), deciduous.  
 Petals 3 or more, imbricated,  
 hypogynous, in several rows. Sta-  
 mens  $\infty$ , distinct, hypogynous;  
 anthers adnate, long. Carpels  
 several, arranged upon a torus  
 above the stamens, 1-celled; ovules  
 anatropal, one or more, ascending  
 or suspended; styles short, stig-  
 mas simple. Fruit either dry or  
 succulent, consisting of numerous  
 carpels, which are either dehiscent  
 or indehiscent, distinct or  
 partially connate, always nume-  
 rous, often collected in a cone upon  
 a lengthened axis, sometimes ter-  
 minated by a membranous wing. Seeds  
 solitary, or several, attached to the inner  
 edge of the carpels, from which, when  
 ripe and open, they often hang suspended  
 by a delicate umbilical cord, often enve-  
 loped in an aril. Embryo minute, at the  
 base of fleshy albumen.

In this Order are included some of the  
 finest trees and shrubs in the world, strik-  
 ingly beautiful in their flowers and foliage,  
 often of very considerable size, and in the  
 majority of cases emitting the most frag-  
 rant odours. They are closely allied to  
 Diapnyctes, which have a quinary arrange-  
 ment of the calyx and corolla and no sti-  
 pules, and to Anonads, which also have a  
 ternary arrangement of the floral enve-  
 lopes and a very great similarity in general  
 structure; but in that Order the petals  
 have a valvate aestivation, and no stipules  
 are present, besides which the albumen  
 is ruminated like that of a Nutmeg. In  
 Winter's Barkes, or Winteræ, which do  
 not seem to possess any solid distinction  
 from Magnoliads, the wood has been ob-  
 served to present the singular circular  
 disks which are so abundant and remark-  
 able in Coniferous plants.\* The genus Tasmania, called in India *Alseodaphne*, *Sesuvium*

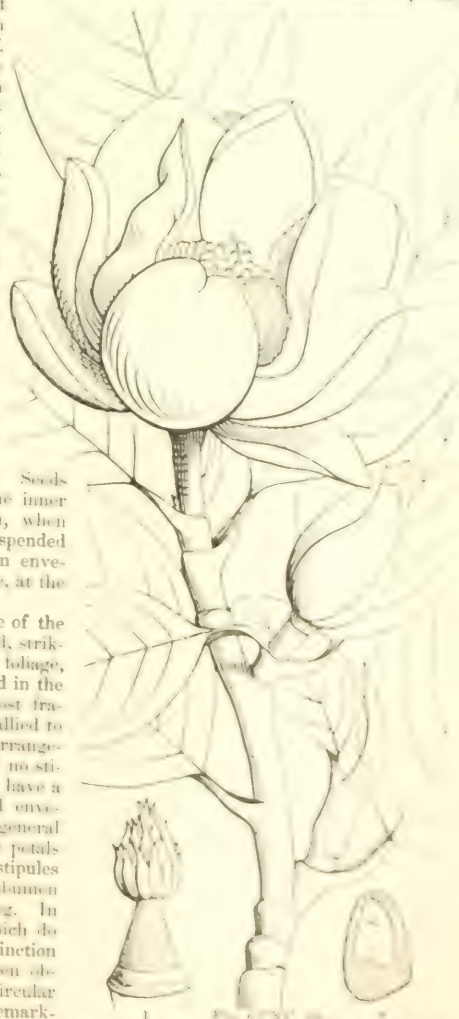


Fig. CCXC. 1. Magnolia flower. 2. Magnolia fruit.

\* This has been denied or confirmed, I hardly know which, but I remember seeing the Magnolia in the  
 cabinet was in one place that the wood of the Magnolia was sometimes used for the same purpose as  
 wood of the Anonads, and in another place that a Magnolia was sometimes used for the same purpose as  
 wood of the Anonads. — *Flora* 1. 77. 1820. *Flora* 1. 77. 1820. *Flora* 1. 77. 1820. *Flora* 1. 77. 1820.



rather to be polygamous, and therefore has no claim to be regarded as an exception to the hermaphrodite character of this Order ; the tendency, however, in that genus to unisexuality corroborates the opinion of some Botanists, that Magnoliads approach certain diclinous Orders included in the Urtical Alliance, as is indicated by their large convolute stipules, which are very like those of Figs and other genera of Morads. Tasmannia is, indeed, quite an anomalous plant. It is so nearly related to the aromatic Winter's Bark, *Drimys Winteri*, from which its unisexual flowers and solitary carpels chiefly distinguish it, that it must follow the affinity of that plant. For this reason it seems necessary to associate it with the Order of Magnoliads rather than with that of Kadsurads or Anonads. The three Orders are generally distinguished by the following characters:—Magnoliads are bisexual, have stipules of large size, and their flowers have an imbricated æstivation. Kadsurads resemble them in all things, except the want of stipules, and their flowers being absolutely unisexual. Anonads are bisexual like Magnoliads, but they have no stipules, their corolla is valvate, and their albumen ruminate. Moreover Magnoliads are astringent sub-aromatic trees or bushes ; Anonads are similar in quality, but they are more aromatic ; Kadsurads are scrambling plants with no aroma. If we regard the aromatic quality of Tasmannia, it will belong to either Magnoliads or Anonads ; but from the former it differs in the want of stipules, from the latter in its imbricated corolla, and from both in its unisexual flowers. On the other hand it has the unisexual flowers of Kadsurads, but not their habit nor their mucilaginous qualities. Its unisexual flowers, however, point strongly in the direction of Kadsurads ; but then it is not separable from *Drimys*, which is bisexual, and, moreover, its own flowers are in reality in many cases furnished with a central carpel. Tasmannia must then be regarded as having a manifest tendency towards hermaphroditism, while no such attribute is known among Kadsurads. For these reasons it will be stationed along with *Drimys* among bisexual Natural Orders, and then will necessarily fall into the ranks of Magnoliads ; for its imbricated corolla and homogeneous albumen are at variance with the most essential peculiarity of Anonads. It, however, like *Drimys* itself, wants the stipules of Magnoliads, in which respect it is exceptional to the usual character of that Natural Order, and must be regarded as a genus stationed on the frontier between Kadsurads and Magnoliads. The small perigynous Order of Calycanthus is moreover so like *Illicium* in appearance, and there is so much resemblance between them in their separate carpels, that, although their affinity is by no means direct, yet we must suppose that some cross relationship exists between them. According to Blume, the umbilical cord, which is so remarkably extensible in some of these plants, is wholly composed of a multitude of delicate spiral vessels.

The focus of the Order is undoubtedly North America, where the woods, the swamps, and the sides of the hills abound with the species. Thence they straggle, on the one hand, into the West India Islands, and on the other, into India, through China and Japan. Brown remarks (*Congo*, 465), that no species have been found on the continent of Africa, or any of the adjoining islands.

The general character of the plants of this Order is to have a bitter tonic taste, and fragrant flowers. The latter produce a decided action upon the nerves ; *Magnolia tripetala*, according to De Candolle, induces sickness and headache ; and on the authority of Barton, *Magnolia glauca* is so stimulating as to produce paroxysms of fever, and even an attack of inflammatory gout. The bark has been found to be destitute of tannin and gallic acid, notwithstanding its intense bitterness. None of the species can be said to have eatable fruits. Among the most fragrant are the Tsjampac or Champaca, a species of *Michelia* so called, which is the delight of the people of Hindostan ; the *Magnolia grandiflora*, one of the noblest of evergreen trees ; *Magnolia pumila*, well known in green-houses for its brownish-green flowers ; while the Yulan, *Magnolia conspicua*, is unrivalled among northern trees for the surpassing brilliancy of its large and snow-white flowers upon gray and naked branches. As tonics many have great value. The Swamp Sassafras, or Beaver tree (*Magnolia glauca*), has a bitter and aromatic bark, resembling and even rivalling in its qualities Cinchona. It is particularly useful in chronic rheumatism, whether the bark, seeds, or cones are employed. The same qualities are recognised in *Liriodendron tulipifera*, the seeds of *Magnolia Yulan*, called in China Tsin-y, *grandiflora*, and others. All the parts of *Michelia Tsjampaca* appear to be powerfully stimulant. Of *Magnolia Frazeri* (*auriculata*, *Bartr.*), and *M. acuminata*, both called Cucumber-trees in the United States, the bitter and somewhat aromatic infusion of the green cones in whisky or brandy is extensively used against intermittent fevers, and also in rheumatic affections. The tonic qualities of these plants are partly owing to their aromatic secretions, which sometimes become very intense. The *Aromadendron elegans* of Java is one of the most remarkable, and has a great local reputation as a stomachic, antihysterical, and carminative. *Michelia montana* bark is



compared for affinity to *Cuscutella*, but it is less like it. *Michelia gracilis* has many strongly of *Cuscutella*. The above plant of Illinois agrees, especially the fruit, in a plant from the State of Acon. several had rather pungent. It is produced a somewhat and minutely along the Chinese, and is used as a tonic in their country. The fruit is aromatic and cooling.



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very uncertain whether it belongs to any plant of this Order. The bark of *Alchornea* *grammatensis*, called Cassia d'Alma in Brazil, is much used against colic. It is tonic, aromatic, and stimulant, and resembles, in nearly all respects, the *Drinax* Winters, or Winter's Bark. Similar in their nature are *Drinax* *axillaris* and *Tectonaria* *aromatica*, one a New Zealand and the other a New Holland tree, whose fruit is occasionally used as pepper by the settlers in Tasmania. Many are valuable for their timber. *Mibelia* *Doldisopa* is one of the finest trees in Nipal, yielding an excellent fire-wood, much used in that country for house-burning. — *Ind. Penins.* 226. 246. *exelsa* has a valuable timber called Champ, at first greenish, but soon changing into a pale yellow; the texture is fine. *Manglietia glabra* has a white soft wood which is largely employed in Java, and supposed to prevent the decay of corpses put into it. Another valuable timber of the same country is that of *Ammodendron* *argenteum*. Blume remarks that *Magnoliads* are absolutely known from *Dilleniads* by their lower aromatic properties; the latter never being anything beyond styptics.

## C. E. NIERA

1. <i>Magnolia</i> , R. & H. — Corolla pale greenish in flower. Leaves not dotted, or scarcely.	<i>Indolepis</i> , Sieber. <i>Yucca</i> , Sieber. <i>Yucca</i> , Sieber. <i>Yucca</i> , Sieber. <i>Yucca</i> , Sieber.	2. <i>Wendlandia</i> , — <i>Corolla</i> yellow, in a single row, four-lobed. Leaves not dotted, or scarcely.	<i>Wendlandia</i> , Sieber. <i>Wendlandia</i> , Sieber. <i>Wendlandia</i> , Sieber. <i>Wendlandia</i> , Sieber. <i>Wendlandia</i> , Sieber.
3. <i>Magnolia</i> , R. & H. — Corolla pale greenish in flower. Leaves not dotted, or scarcely.	<i>Indolepis</i> , Sieber. <i>Yucca</i> , Sieber. <i>Yucca</i> , Sieber. <i>Yucca</i> , Sieber. <i>Yucca</i> , Sieber.	4. <i>Wendlandia</i> , — <i>Corolla</i> yellow, in a single row, four-lobed. Leaves not dotted, or scarcely.	<i>Wendlandia</i> , Sieber. <i>Wendlandia</i> , Sieber. <i>Wendlandia</i> , Sieber. <i>Wendlandia</i> , Sieber. <i>Wendlandia</i> , Sieber.

NUMBERS, GEN. 11. 840. 82.

Munro, R. D.

Position — *Abolition* — *Macmillan* — *DeLorme* —  
*Schubert* —  
*Moscow*

Fig. 6. CONCl—1 (the rest and part); 2—conc. (8. A) concentration of monomer.

## ADDITIONAL COMMENTS



## ORDER CLII. ANONACEÆ.—ANONADS.

*Anonæ*, Juss. Gen. 283. (1789).—*Anonaceæ*, Rich. Anal. Fr. 17. (1808); Dunal. Monogr. (1817); DC. Syst. 1. 462. (1818); Prodr. 1. 83. (1824); Bl. Fl. Jav.; Alph. De Cand. in Mem. Phys. Genev. (1832); Wight Illustr. 1. 17; Endl. Gen. clxxiv.; Meisner, Gen. p. 4.—*Glyptospermæ*, Vent. Tab. 3. 75. (1799.)

DIAGNOSIS.—*Ranal Exogens*, with distinct carpels, no stipules, a valvate corolla, and ruminant albumen.

Trees or shrubs. Leaves alternate, simple, almost always entire, without stipules. Flowers usually green or brown, axillary, solitary, or 2 or 3 together, shorter than the



Fig. CCXCII.

leaves; the peduncles of abortive flowers sometimes indurated, enlarged, and hooked.

Sepals 3, persistent, usually partially cohering. Petals 6, hypogynous, in two rows, coriaceous, with a valvate aestivation, sometimes united into a monopetalous corolla, very rarely absent. Stamens indefinite, covering a large hypogynous torus, packed closely together, very rarely definite; filaments short, more or less angular; anthers adnate, turned outwards, with an enlarged 4-cornered connective, which is sometimes nectariferous. Carpels usually numerous, closely packed, separate or cohering, occasionally definite; styles short; stigmas simple; ovules solitary, or a small number, erect or ascending, anatropal. Fruit consisting of a number of carpels, which are either succulent or dry, sessile or stalked, 1- or many-seeded, distinct or concrete into a fleshy mass. Seeds attached to the suture in one or two rows, sometimes furnished with an aril; testa brittle; embryo minute, in the base of hard, fleshy, ruminant albumen.

*Monodora* has a solitary carpel. In *Anona palustris* the ovaries are not distinct. The stamens and carpels are definite in *Bocagen*.

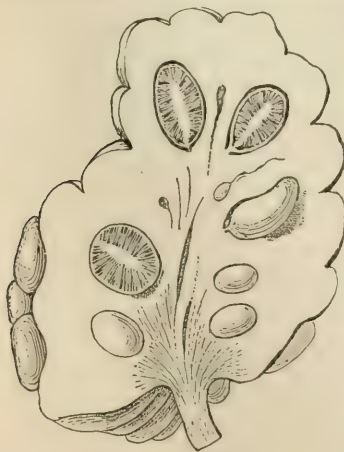


Fig. CCXCIII.

The flowers are pentamerous in *Hentschelia*.

Fig. CCXCII.—*Anona furfuracea*. 1. an expanded flower; 2. a vertical section of ♂ and ♀ apparatus, which latter occupies the centre; 3. a vertical section of a carpel; 4. ditto of a ripe seed, showing the ruminant albumen and embryo.

Fig. CCXCIII.—Section of ripe fruit of *Anona squamosa*.—Martius.



The corolla of these plants is so frequently monopetalous, that it affords one of the most striking instances that can be found of the worthlessness of the preponderant structure as a fundamental mark of distinction. And most of the affinity given by the direction of monopetalous Orders. No doubt can be entertained of the close arrangement of this Order to Magnoliads, from which, however, it differs as the want of anther, or its valvate corolla, and in the form of the anthers (agglutinated in the primary division of the parts of fructification, and the indefinite stamens and ovaries. An affinity has been pointed out with Menispermads; but it appears to be weak. The great feature of the Order is its ruminated lobes, to which there is no exception, and very few parallels. The parietal insertion of ovules, ascribed to the Order by De Cussler, is not universal. The ovules are erect in *Anona*, *Guatteria*, and *Anaxagorea*. A remarkable plant is described by Brown, in the Appendix to *Willdow's Catalogue*, under the name of *Espermetia laurina*, in which the stamens are manifestly parietal, and the form of the ovary (coherent with the ovaries. This plant affords one of the most remarkable exceptions we know of to habitual structure. It is no doubt analogous to *Eschscholzia*, *Poppyworts* and *Rosa* in *Roseworts*. I have remarked in *Anona laurifolia* that the pollen is arranged in two distinct rows in each cell of the anther, and that when the organs burst, the grains of pollen fall out, clustering in a single row, so as to have the appearance of a necklace. Anonads are connected with Berberids through *Boussa*. I am inclined to think there can be no doubt of the affinity of the Order to Nittogae; as has been indicated by Blume and fully admitted by Endlicher.

The tropics of the Old and New World are the natural land of these plants: thence they spread, in a few instances, to the northward and the southward. Some of them, useful to man, such as the Custard-apple, the Chermoyer, and others, have been carried by colonists far from their native stations.

Their general character is, to have a powerful aromatic taste and smell in all the parts. The bark of *Uvaria tripetaloidea* yields, being tapped, a viscid matter, which hardens in the form of a fragrant gum. The flowers of many species, especially of *Artabotrys odoratissima* and *Guatteria virgata*, are exceedingly sweet. The dry fruits of others are very aromatic; those of *Xylopia aromatica* are the Pepper of the shops, and are commonly used as pepper by the African negroes. The leaves of *Artabotrys* are regarded as invaluable in Java against cholera. The Polygamies of Java are employed in Java with advantage as aromatics of great energy, especially their roots. The leaves of *Anona squamosa* have a heavy disagreeable odour, and the seeds contain a highly acrid principle fatal to insects, on which account the natives of Java use them powdered and mixed with the flour of Gram, or *Cicer arietinum*, for occasionally washing their hair. *Xylopia sericea*, a large tree found in Brazil near Rio Janeiro, where it is called Pindaíba, bears a highly aromatic fruit, with the flavour of pepper, for which it may be advantageously substituted. Its bark is tough, and readily separated into fibres, from which excellent cordage is manufactured. Blume remarks that the Javanese species require, because of their powerful properties, to be employed with caution; for if they are administered for too great a length of time, or in too large doses, they produce vertigo, hæmorrhage, or even abortion, in pregnant women. The carpels are chewed after dinner in Java for dissolving flatulency. *Xylopia glabra*, we are told, is called Bitter-wood in the West Indies, because of the presence of well-marked bitterness in every part. The wood, bark, and berries are said to taste like Orange seeds. The wild pigeons that feed on the berries are said to acquire their flavour, and sugar hogsheds made of the wood are reported to render their contents uneatable, even by cockroaches. Of some species the fruit is somewhat acid and agreeable, containing a sugary mucilage, which predominates over the slight aromatic flavour that it possesses. Of this kind are the delicious Custard-apples of the East and West Indies, the Chermoyer of Peru, and others. In *Uvaria* bitter acid is present of a very active nature, according to Poirault's, but this is not common. Its leaves are used to bring languid abscesses to a head, its roots are said to be vermifuge. The *Anona sylvatica*, called *Annona do mato*, in Brazil, has a light white bark, very fit for the use of turners, and for the same purposes as the *Litsea* of Europe. Its fruit is described as good for the dessert. The wood of the tree in *A. palmata* is employed in Brazil for corks. Martius has remarked that many species of *Xylopia* yield gum with great facility, even though the smallest pieces are submitted to the knife. The strong elastic wood called Lancewood by the conchologists, the *Xyloperu* of China, is said by Schomburgk to be obtained from *Duguetia quercifolia*. Martius found the specific gravity of the wood of a species of *Guatteria*, called *Guatteria guianensis*, to be 0.92 after being kept for 20 years in a dry room. See Hooker's *Flora* for many interesting particulars concerning the plants of the Order. The Indians in the Orinoco, particularly in Atures and Maypura, have an excellent beverage, called *Fruita de Burro*, which is the fruit of *Uvaria tripetaloidea*, or *Xylopia grandiflora*.



according to Martius. The Calabash Nutmeg, *Monodora Myristica*, is a rival of the true Nutmeg for aromatic qualities ; it is not, however, quite certain that it belongs to this place.

# GENERA.

<p>I. <i>Bocageæ</i>.—<i>Endl.</i>  <i>Bocagea</i>, <i>St. Hil.</i>  <i>Poppowia</i>, <i>Endl.</i>  <i>Orophea</i>, <i>Blum.</i>  <i>Miliusia</i>, <i>Alph. DC.</i>  <i>Saccopetalum</i>, <i>Benn.</i></p>	<p><i>Xylopia</i>, <i>Linn.</i>  <i>Bulliarda</i>, <i>Neck.</i>  <i>Xylopiaron</i>, <i>P. Br.</i>  <i>Embira</i>, <i>Maregr.</i>  <i>Pindasiba</i>, <i>Piso.</i>  <i>Ibira</i>, <i>Maregr.</i>  <i>Habzelia</i>, <i>Alph. DC.</i>  <i>Waria</i>, <i>Aubl.</i>  <i>Cælocline</i>, <i>Alph. DC.</i>  <i>Patonia</i>, <i>Wight.</i>  <i>Uvaria</i>, <i>Linn.</i>  <i>Unona</i>, <i>Linn. f.</i>  <i>Krokeria</i>, <i>Neck.</i>  <i>Mitrephora</i>, <i>Blum.</i></p>	<p><i>Asimina</i>, <i>Adans.</i>  <i>Orchidocarpum</i>, <i>L. C.</i>  <i>Rich.</i>  <i>Porcelia</i>, <i>Ruiz et Pav.</i>  <i>Melodorum</i>, <i>Lour.</i>  <i>Triggyneia</i>, <i>Schlecht.</i>  <i>Desmos</i>, <i>Lour.</i>  <i>Marentheria</i>, <i>Noronh.</i>  <i>Hexalobus</i>, <i>Alph. DC.</i>    <p>III. <i>Anonææ</i>.—<i>Endl.</i>  <i>Anaxagorea</i>, <i>St. Hil.</i>  <i>Artabotrys</i>, <i>R. Br.</i></p> </p>	<p><i>Guatteria</i>, <i>Ruiz et Pav.</i>  <i>Cananga</i>, <i>Aubl.</i>  <i>Aberemoa</i>, <i>Aubl.</i>  <i>Oxandra</i>, <i>A. Rich.</i>  <i>Duguetia</i>, <i>St. Hil.</i>  <i>Cardiopetalum</i>, <i>Schl.</i>  <i>Anona</i>, <i>Linn.</i>  <i>Guanabanus</i>, <i>Plum.</i>  <i>Atta</i>, <i>Martius.</i>  <i>Rollinia</i>, <i>St. Hil.</i>  <i>Monodora</i>, <i>Dun.</i>  <i>Lobocarpus</i>, <i>Wight et Arn.</i></p>
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NUMBERS. GEN. 20. Sp. 300.

POSITION.—*Magnoliaceæ*.—*Myristicaceæ*.  
*ANONACEÆ*.  
*Berberidaceæ*.

*Clethraspernum*, Planchon = *Uvaria* (Bentham.)

From the observations of Mr. Bentham, it appears that the valvate æstivation of the petals is by no means universal.—*Fl. Nig.* 212.







legs and other parts, very common maladies in hot and humid parts of South America. *Davilla elliptica* is also astringent, and furnishes the vulnerary called Sambaibinha in Brazil. In *Curatella Sambaiba* the same astringent principle recommends its decoction as an excellent wash for wounds; this plant is also used by tanners in Brazil. The young calyxes of *Dillenia scabrella* and *speciosa* have a pleasantly acid taste, and are used in curries by the inhabitants of Chittagong and Bengal. *Tetracera Tigarea* (Liane rouge) is diaphoretic and diuretic, and has the reputation of being an antisyphilitic. The acid juice of *Dillenia speciosa* fruit is, according to Rheede, when added to syrup, considered useful as a cough mixture. The ripe fruits are said to be laxative, and even to produce diarrhoea. Almost all *Delimeæ* have the foliage covered with asperities, which are sometimes so hard that the leaves are even used for polishing.

The Indian species are in almost all cases plants of great beauty. Dr. Wight speaks of them as remarkable, not less for the grandeur of their foliage than the magnificence of their flowers. He adds, that several species of *Dillenia* are large trees, and afford hard, durable, valuable timber.

# GENERA.

<p>I. DILLENEÆ. — Connective of anthers equal, or narrow at the point. Asiatic and Australian.</p> <p><i>Capellia</i>, Blum.  <i>Colbertia</i>, Salisb.  <i>Reifferscheidia</i>, Presl.  <i>Dillenia</i>, Linn.  <i>Syalita</i>, Adans.  <i>Actinidia</i>, Eindl.  <i>Wormia</i>, Rottb.  <i>Clugnia</i>, Commers.  <i>Lentida</i>, Thouars.  <i>Schumacheria</i>, Vahl.  <i>Pleurodesmia</i>, Arn.</p>	<p><i>Adrastea</i>, DC.  <i>Hibbertia</i>, Andr.  <i>Burtonia</i>, Salisb.  <i>Cistomorpha</i>, Caley.  <i>Saurauja</i>, W.  <i>Palava</i>, R. &amp; P.  <i>Apatelia</i>, DC.  <i>Scapha</i>, Nor.  <i>Vanalphimia</i>, Lesch.  <i>Marumia</i>, Reinw.  <i>Reinwardtia</i>, Nees.  <i>Blumia</i>, Spreng.  <i>Trochostigma</i>, Sieb.  <i>Pleurandra</i>, Labill.  <i>Candollea</i>, Labill.  <i>Pachynema</i>, R. Br.</p>	<p><i>Hemistemma</i>, Commers.  <i>Aglaja</i>, Noronh.  <i>Acrotrema</i>, Jack.</p> <p>II. DELIMEÆ. — Connective of anthers dilated at the point. Chiefly American.</p> <p><i>Curatella</i>, Linn.  <i>Pinzona</i>, Mart. et Zucc.  <i>Doliocarpus</i>, Roland.  <i>Calinea</i>, Aubl.  <i>Soramia</i>, Aubl.  <i>Mappia</i>, Schreb.  <i>Othlis</i>, Schott.</p>	<p><i>Empedoclea</i>, St. Hil.  <i>Davilla</i>, Velloz.  <i>Hieronias</i>, Flor. Flum.  <i>Delima</i>, Linn.  <i>Tetracera</i>, Linn.  <i>Tigarea</i>, Aubl.  <i>Rhinium</i>, Schreb.  <i>Euryandra</i>, Forst.  <i>Assa</i>, Houtt.  <i>Wahlbomia</i>, Thunb.  <i>Röhlgingia</i>, Dennst.  <i>Trachytella</i>, DC.  <i>Actæa</i>, Lour.  <i>Calligonum</i>, Lour.  <i>? Recchia</i>, Moc. et Sess.</p>
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NUMBERS. GEN. 26. Sp. 200.

## *Pittosporaceæ.*

POSITION.—*Ranunculaceæ*.—DILLENACEÆ.—*Magnoliaceæ*.  
*Ericaceæ*.

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*Trochostigma* = *Actinidia*.



## ORDER CLIV. RANUNCULACEÆ. CROWFOOT.

*Ranunculi Juss. Gen.* (1789). — *Ranunculaceae DC. Syst. 1. 137* (1838). — *Gray, J. 2. Engelm. Bot. Beechey. Voy. Mex. class. vii.* ; *Molken. Gen.* 1. 1. *Wright. Journ.* 1. p. 1. *Boiss. Fl. Orient.* 1. 1. *DC. Syst.* 2. 32 (1821). *Poir. 1. III.* — *Pal. phyl. ex. Musc. Contr. 3. 371* (1838).

**DIAGNOSIS.**—*Ranul. Europ.*, with distinct carpels, no separate staminal, an imbricated corolla, longepeduncled flowers, and usually without an oil.

Herbs, or rarely shrubs. Leaves alternate or opposite, generally much divided, with the petiole dilated and forming a sheath half clasping the stem. Stipule-like prophylls occasionally present. Hairs, if any, simple. Inflorescence variable. Flowers usually com-

spituous ; if apetalous, those with the sepals large and fully coloured. Sepals 5-6, hypogynous, deciduous, generally imbricate in aestivation, occasionally valvate or slightly ciliate. Petals 3-17, hypogynous, in one or many rows, distinct, sometimes dehiscent, in some cases missing. Stamens 00, (very rarely definite,) hypogynous ; anthers adnate. Carpelis numerous, 1-celled or united into a single many-celled pistil ; ovary one or more-celled, the ovules sutural ; style simple ; ovules anatropous. Fruit either consisting of dry akenia ; or baccate with one or more seeds ; or baccate with one or two valves. Seeds albuminous ; when solitary, either erect or pendulous. Embryo minute. Albumen horny.

Under the name of Crowfoots is collected a very considerable number of plants, differing from each other materially in the aspect of their calyx and corolla, but very similar otherwise. Some of them have perfectly distinct sepals and petals, in others these parts are com-

pletely blended together, as in *Calla* and *Anemone* ; in others it is intermediate, and the former only are present, as in *Thalictrum*. Those two, which have their parts quite distinct, vary usually from the real Crowfoots in their nature, the calyx or corolla being somewhat less open, and assuming a very particular condition in various ways, as in the *Gemma* and *Laryx*.

spurs. It is, however, very interesting to find the spurred irregular-flowered plants of this Order assimilated with the regular spurless species by natural Ranunculaceae, an Antarctic species, the petals of which have a secret in their mobility, concealing the spurs of *Aquilegia*, &c.

The Order has a strong affinity with some which are widely apart from each other. Its most immediate resemblance is with *Ullernaceae*, *Magnoliaceae*, and then

Fig. CCXCV. — 1. *Ranunculus bulbosus*. 2. pistil of *R. acris*. 3. a perianthium showing the position of its carpels : 4. a similar section of the tip of a flower.





allies, to which it approaches in the position, number, and structure of its parts of fructification generally, differing however in abundance of particulars; as from Dilleniads in the want of an aril, a deciduous calyx, and whole habit; from Magnoliads in the want of true stipules; from Poppies and Water-lilies in the distinct, not concrete, carpels, watery, not milky fluids, and acrid, not narcotic properties. To Berberids it approaches so very closely that Podophyllum is by many authors placed in that Order; from which, however, it differs essentially in its stamens not bursting by recurved valves; it, however, evidently forms a connecting link between the two Orders. More distant analogy may be traced with Roseworts, with which Crowfoots strikingly agree in their numerous carpels, floral divisions, and indefinite stamens; but differ in their stamens being hypogynous instead of perigynous, in the presence of large albumen surrounding a minute embryo, want of true stipules, and acrid properties. With Umbellifers they accord in the last particular, and also in their sheathing leaves, habit, and abundant albumen, with a minute embryo; but those plants differ in their calyx being concrete with the ovary, and in their stamens being invariably definite.



Fig. CCXCVI.



Fig. CCXCVII.



Fig. CCXCVIII.

Another analogy has been indicated by Botanists between this Order and Water-plantains, which agree in their numerous carpels, habit, and sometimes in a ternary structure of their flowers; but Water-plantains are monocotyledonous. An instance is described of the polypetalous regular corolla of Clematis viticella being changed into a monopetalous irregular one, like that of Labiatae.—*Nov. Act. Acad. N. C.* 14, p. 642, t. 37. The genus *Paeonia* is remarkable for producing in one of its species, the Moutan, the largest form of disk known in the vegetable kingdom.

The largest proportion of this Order is found in Europe, which contains more than 1-5th of the whole; North America possesses about 1-7th, India 1-25th, South America 1-17th; very few are found in Africa, except upon the shores of the Mediterranean: eighteen species have, according to De

Fig. CCXCVI.—*Aquilegia vulgaris*.

Fig. CCXCVII.—*Delphinium tricornis*. 1. petals and stamens; 2. carpels; 3. a branch of ripe fruit.

Fig. CCXCVIII.—The ovary of *Paeonia Moutan*, surrounded by its broken disk.



Candolle, been discovered in New Holland. They characterize a cold damp climate, and are, when met with in the tropics, found inhabiting the wet and mountainous mountains; in the lowlands of hot countries they are almost unknown.

Acridity, causticity, and poison, are the general characters of this extensive Order, which, however, contains species in which these qualities are in little developed as in hemlock. The caustic principle is, according to Krapf, as used by De Candolle, of a very singular nature; it is so volatile that, in most cases, simple drying, either in water, or boiling, are sufficient to dissipate it; it is neither acid nor alkaline; it is increased by acids, sugar, honey, wine, spirit, &c. and is only externally destroyed by water and vegetable acids. The leaves of *Knowltonia vesicatoria* are used as vesicant in Southern Africa. *Ranunculus glaberrimus* is a powerful emetic; *Aconitum Napellus* and *Cammarum* are drastic. The Hepatica, *Aconitum racemosum*, and *Delphinium consolida*, are regarded as simple astringents. The roots and leaves of several *Hellebores* are drastic purgatives; of the perennial *Adonis*es, according to Pallas, emmenagogues; and of several *Aconites*, especially *Napellus* and *rosea*, emetic in a low degree. The black *Hellebore* of the ancients was *H. officinalis* rather than *H. niger* (see *Bot. Belg.* 1842, t. 34 & 35). The root of an *Aconitum* of India, one of the 300 stances called *Bikh*, or *Bish*, is a most virulent poison. According to Hamilton, *Indostana*, or *Bilima*, is a strong bitter, very powerful in the cure of fevers. The *Bilbi*, *Bikh*, or *Kodoya Bikh*, has a root possessing poisonous properties of the most dreaded kind, whether taken into the stomach, or applied to wounds; the *Nir Bishi*, or *Nir Bani*, has no deleterious properties, but is used in medicine. For some important information on this *Bikh*, *Vish*, *Vasha*, or *Atavisha*, which Wallis considers for *Aconitum ferox*, see *Pharm. As. Rec.* vol. i. p. 33, tab. 31, and especially *Engel's Pharmacop.* 40. *Ranunculus flammula* and *sceleratus* are powerful epispastics, and are used as such in the Hebrides, producing a blister in about an hour and a half. Their action, however, too violent, and the blisters are difficult to heal, being apt to pass into irreparable ulcers. Beggars use them for the purpose of forming artificial ulcers, and also the leaves of *Clematis erecta* and *flammula*. The root of *Ranunculus Thera* is reported to be extremely acrid and poisonous, its juice having been formerly used by the Swiss hunters of wild beasts to envenom their javelins, whose wound by that means became speedily fatal and incurable. The root of *Hybanum* has a strong and somewhat narcotic smell, and is exceedingly bitter; it is used in North America as a tonic, under the name of Yellow root. The root of *Cypripedium*, or *Indian throat*, is a pure and powerful bitter, devoid of anything like acrimony; it is a popular remedy in the United States for apathetic affections of the mind, in cholera. The wood and bark of *Xanthoxylum* are a very pure pure bitter. The stem contains both a gum and resin, each of which is intensely bitter. The seeds of *Nigella sativa* were formerly employed instead of pepper; those of *Delphinium Staphisagria* are vermifuge, caustic, drastic, and emetic; those of *Antrodia simplicifolia*. It is supposed that a pungent seed used by the Africans under the name of *Sah dara*, for flavouring curries, is the Black Cumin of Scripture, and a species of *Nigella*. *Royle*. Pungy woods are emetic and cathartic; the root has the credit of being antispasmodic. The black berries of the *Banberry*, *Aconitum*, are poisonous, the roots antispasmodic, expectorant, asthmatic; they are reported to have afforded very marked relief in cases of catarrh. Similar qualities are assigned to *Potaphis actaeoides* (*Aconitum racemosum*, L.), whose numerous, numerous, and roots are regarded, in the United States, as a remedy for the colic of the saddleback. Geyer says that the root of a species of *Clematis* is used by the N. American Indians as a stimulant to the horses which drop down during their race. The sap of the root, held to the nostrils of the fallen horse, immediately produces trembling; the animal springs up and is led to water to refresh its labour. *Leaves*. *John. Bot.* V. 301. The fruit of the May-apple (*Podophyllum peltatum*) is said whence its name of Wild Lemon, and may be eaten; but all its parts are poisonous. The leaves are poisonous, and the whole plant noxious. Notwithstanding their reputation, the whole Order, with a few exceptions, has fallen into disrepute. Hence here being almost the only evacuant retained. Dr. Fournier has lately shown that of all the European *Aconites*, one only, *A. Napellus*, is of any value; the remainder, including *A. Cammarum*, being feeble and unimportant in their action.

## GENERA

I. CLEMATIDÆ. — Only 8.	II. ANEMONEÆ. — 10.	III. DELPHINIIDÆ. — 10.	IV. ACONITIDÆ. — 10.
<i>Clematis</i> , L.	<i>Anemone</i> , L.	<i>Delphinium</i> , L.	<i>Aconitum</i> , L.
<i>Clematis</i> , Dillen.	<i>Anemone</i> , Dillen.	<i>Delphinium</i> , Dillen.	<i>Aconitum</i> , Dillen.
<i>Clematis</i> , L. & D.	<i>Anemone</i> , L. & D.	<i>Delphinium</i> , L. & D.	<i>Aconitum</i> , L. & D.
<i>Clematis</i> , Noron.	<i>Anemone</i> , Noron.	<i>Delphinium</i> , Noron.	<i>Aconitum</i> , Noron.



*Campanaria*, Endl.  
*Prenanthus*, Ehrh.  
*Anemanthus*, Endl.  
*Pulsatilloides*, DC.  
*Asteranemia*, Reichb.  
*Anemonanthea*, DC.  
*Oriba*, Adans.  
*Anemonospermus*, DC.  
*Homalocarpus*, DC.  
*Hepatica*, Dill.  
*Knowltonia*, Salisb.  
*Anamenia*, Vent.  
*Thebesia*, Neck.  
*Hamadryas*, Commers.  
*Hydrastis*, Linn.  
*Warneria*, Mill.  
*Adonis*, Dill.  
*Sarpedonia*, Adans.  
*Consiligo*, DC.  
*Adonanthe*, Spach.  
*Callianthemum*, C.A.M.  
*Myosurus*, Dill.  
*Aphanostemma*, St. Hil.

III. RANUNCULÆÆ. —  
 Calyx in æstivation,  
 imbricated. Achenia

without tails; seed  
 erect.  
*Casalea*, St. Hil.  
*Ranunculus*, L.  
*Batrachium*, DC.  
*Ranunculastrum*, DC.  
*Krapfia*, DC.  
*Cyprianthe*, Spach.  
*Thora*, DC.  
*Hecatonia*, Lour.  
*Philonotis*, Reichenb.  
*Echinella*, DC.  
*Ceratocephalus*, Mönch.  
*Ficaria*, Dillen.  
*Scotanum*, Adans.  
*Oxygraphis*, Bung.

IV. HELLEBOREÆÆ. — Calyx,  
 in æstivation, imbricated. Fruit many-  
 seeded follicles.

*Caltha*, Linn.  
*Nirbista*, G. Don.  
*Psychrophila*, DC.  
*Populago*, DC.  
*Thacla*, Spach.

*Trollius*, Linn.  
*Geisenia*, Raf.  
*Hegemone*, Bunge.  
*Eranthis*, Salisb.  
*Koellea*, Birt.  
*Robertia*, Merat.  
*Helleborus*, Mönch.  
*Helleboroides*, Adans.  
*Helleborus*, Adans.  
*Helleboraster*, Mönch.  
*Isopyrum*, Linn.  
*Olfa*, Adans.  
*Thalictrella*, A. Rich.  
*Leptopyrum*, Reichenb.  
*Enemion*, Raf.  
*Coptis*, Salisb.  
*Chrysa*, Raf.  
*Chrysocoptis*, Nutt.  
*Pterophyllum*, Nutt.  
*Garidella*, Tournef.  
*Nigella*, Tournef.  
*Erobatus*, DC.  
*Aquilegia*, Tournef.  
*Delphinium*, Tournef.  
*Consolida*, DC.  
*Aconitella*, Spach.  
*Delphinellum*, DC.

*Phledinium*, Spach.  
*Delphinastrum*, DC.  
*Staphisagria*, DC.  
*Aconitum*, Tournef.  
*Anthora*, DC.  
*Lycactonum*, DC.  
*Cammarum*, DC.  
*Moutan*, Lindl.  
*Pæonia*, L.  
*§ Onapia*, Lindl.  
 V. ACTÆÆÆ. — Calyx  
 coloured, imbricated.  
 Fruit succulent, inde-  
 hiscent, one or many-  
 seeded.  
*Trautvetteria*, Fisch. et M.  
*Actæa*, Linn.  
*Christophoriana*, Tourn.  
*Botrophis*, Raf.  
*Macrotlys*, Raf.  
*Pityrospema*, Sieb.  
*Actinospora*, Turcz.  
*Cimicifuga*, Linn.  
*Xanthorrhiza*, Marsh.  
*Zanthorhiza*, Herit.  
*Podophyllum*, L.

#### ADDITIONAL GENERA.

*Barneoudia*, Gay, near *Eranthis*.  
*Psychrophila*, do. near *Caltha*.  
*Babæanthera*, Edgew.  
*Glaucidium*, Zucc. near *Pæonia*?  
*Podostaurus*, Junghans.  
*Anemonopsis*, Zucc. near *Helleborus*.

NUMBERS. GEN. 41. Sp. 1000.

*Apiacææ.*  
*Berberidacææ.*

POSITION. — Papaveracææ. — RANUNCULACEÆÆ. — Dilleniaceææ.  
*Alismacææ.*



Fig. CCXCVIII. bis.

CEPHALOTÆÆ. (R. Brown, Phil. Mag. (1832). — *Cephalotacææ*, Lindl. Key. No. 5. (1835; Ed. pr. No. 5). A stemless herb with exstipulate leaves, among which are mingled operculate pitchers. Scape simple, bearing a compound terminal spike. Flowers small. Calyx coloured, six-parted, with a valvate æstivation. Corolla 0. Stamens 12, those opposite the sepals shortest, inserted into the edge of a deep glandular perigynous disk: anthers with a thick granular connective. Carpels 6, distinct, one-seeded; ovule erect. Akenia membranous, opening by the ventral suture, surrounded by the persistent calyx and stamens. Seed solitary (very seldom two erect. Embryo minute, in the base of the axis of a fleshy friable somewhat oily albumen. — The single species on which this imaginary Order has been founded is a native of the marshes of King George's Sound in New Holland. It is allied, according to Labillardiere, to Roseworts, and according to Jussieu, to Houseleeks; according to Brown, the Order should be placed between Houseleeks and Francoads. Its very copious albumen and apocarpous fruit seem, however, to fix it far from the former of those Orders, and to place it unquestionably in the Ranal Alliance, from which it forms a transition to Francoads in the Berberal Alliance, and through those plants to Sarraceniads, in which the leaves are in like manner transformed into pitchers. The difficulty that Botanists have found in deciding where to place it, has arisen out of the apparently perigynous station of its stamens, which are represented as growing from the outer edge of a deep glandular perigynous disk. But if, as seems probable, that disk is a mere expansion of the footstalk, analogous to what occurs in *Eschscholtzia*, then all difficulty about the station is removed, and the genus will fall into the ranks of the Crowfoots; a probability somewhat increased by its valvate æstivation, which is like that of *Clematis*. GENUS. *Cephalotus*, R. Br. Gen. 1. Sp. 1.

Fig. CCXCVIII. bis. — *Ceratocephalus orthoceras*. 1. flower; 2. ripe fruit; 3. ovaries of *Ranunculus Krapfia*; 4. section of carpel and seed of the same.



## ORDER. CLV. SARRACENIACEÆ. — SARRACENIACEÆ.

Sarracenidæ. *Purpurea floris, foliis linearibus, pediculis brevibus, fructibus capsulis, semine ovato.*  
*Herb. Fl. Borac. Amer. p. 101 (1761) (Jussieu, p. 301) (Moench, p. 104)*

DIAGNOSIS. — *Terrestrial plants, with succulent or coriaceous, permanent, deeply veined, leafy phloem.*

Herbaceous perennial plants, living in bogs. Roots fibrous. Leaves rolled, with a hollow urn-shaped petiole, at whose apex is articulated the lamina, which bears one or a few flowers, of a more or less herbaceous colour, or white. Calyx 4-5-leaved, bristly-veined, much imbricated, without a corolla; or consisting of 5 persistent sepals, often having a 5-leaved involucre on the outside, and 5 hypogynous, unguiculate, concave petals. Stamens 10, hypogynous; anthers oblong, adnate, 2-celled, bursting internally and longitudinally. Ovary free, 3-5-celled, with polyspermous placentæ in the axis; style simple, truncate, or expanded into a large peltate plate with 5 stigmatic angles; ovules anatropal. Capsule with 2-5 cells. Seeds very numerous, minute, slightly warted or winged, covering large placentæ, which project from the axis into the cavity of the cells; albumen abundant; embryo cylindrical, lying near the base of the seed, with the radicle turned to the hilum.

The genus *Sarracenia*, inhabiting the bogs of North America, bears the strange name of *Saddle-flower*, in allusion to the singular tubular leaves of itself and its ally. So long as the former alone was known, no clear idea could be formed of its affinity, and a large peltate plate which terminates the style and bears a stigma beneath each of its 5 angles, was thought to be essential to the Order which it represents; but the discovery in Guiana, by Sir R. Schomburgk, of a very curious genus in which the stigma is reduced to a truncated point, shows that opinion to be unfounded. The same fact also proves that the floral envelopes are subject to great diversity of condition, consisting, in *Sarracenia* itself, of 5 sepals and 5 distinct petals, but reduced in *Heliamphora* to 4, 5, or perhaps 6, imbricated segments, standing in the place of both calyx and corolla. This deviation from what may be termed the typical structure of the Order is quite analogous to what occurs among *Cyrtandæ*, where the *Antennulus* may be compared to *Sarracenia* and *Caltha* to *Heliamphora*. The basis to the supposition that it is in the neighbourhood of the Rand Affair that *Sarracenidæ* are to be placed; and in fact *Papaveraceæ*, which are *Randæ* with completely smooth-edged carpels, must be taken as the nearest connection of these singular plants.

The pitchers appear to be secreting organs, for they are lined by layers of a very singular nature, as is mentioned in Mr. Bentham's *Monacæ* on *Heliamphora*, in *Ann. Phil. Acad. Nat. Hist. Lond.* p. 429; but their physiological action remains to be ascertained.

The species are confined to the bogs of North America, with the exception of *Heliamphora nutans*, found in Guayana.

Their uses are unknown.

## GENERA

*Sarracenia*, Linn. | *Cyrtandæ*, Moench | *Heliamphora*, Flueg. | *Heliamphora*, Moench.

See *Papaveraceæ*, p. 430. | NUMBERS. GEN. L. Sp. I.

*Described*

POSITION.—*Papaveraceæ* — SARRACENIACEÆ — *Heliamphora*.

FIG. CCXCIX.—*Heliamphora nutans*. 1. The pistil and seed; 2. The flower; 3. The capsule; 4. The seed; 5. The embryo.



## ORDER CLVI. PAPAVERACEÆ.—POPPYWORDS.

Papaveraceæ, *Juss. Gen.* 236. (1789) *in part*; *DC. Syst.* 2. 67. (1818); *Prodr.* 1. 117. (1824); *Bernhardi in Linnaea.* 8. 401. (1833); *Endl. Gen.* clxxx.; *Meisner*, p. 7; *Wight Illustr.* 1. 27.

DIAGNOSIS.—*Ranul Exogens*, with dimorous or trimerous flowers, consolidated carpels, deciduous calyx, and usually parietal placenta.

Herbaceous plants or shrubs, often with a milky juice. Leaves alternate, simple or divided, without stipules. Peduncles long, 1-flowered; flowers never blue. Sepals 2 (or 3), deciduous. Petals hypogynous, either 4 (or 6), or some multiple of that number, usually crumpled before expansion, occasionally 0. Stamens hypogynous, 00; anthers 2-celled, innate. Ovary 1-celled, with parietal placenta; which in *Romneya* adhere in the axis; style short, or none; ovules 00, anatropal. Fruit 1-celled, either pod-shaped, with parietal or sutural placenta, or capsular, with several placenta. Seeds numerous; albumen between fleshy and oily; embryo minute, straight, at the base of the albumen, with plano-convex cotyledons.

The common Redweed of the corn fields offers a good representation of the general character of the plants of this Order, whose appearance is varied principally by the flowers being white or yellow, and occasionally by their being collected into dense panicles, when they are greatly reduced in size, and even in the number of their parts, *Bocconia* having no petals. In this state they approach the Crowfoots through *Thalictrum*. In general also their carpels are completely consolidated, but in the curious genus *Platystemon*, they are as distinct as in a Crowfoot, and in fact that genus would be referable to *Ranunculaceæ* if it were not for its 2 sepals, no such number being known in that Order.

The siliquose-fruited genera, such as *Glaucium* and *Eschscholtzia*, have been supposed to indicate the near affinity of this Order to *Crucifers*; but the totally different structure of their seeds is such as to neutralise what little affinity may be indicated by the form of the fruit. Through *Papaver* the Order approaches *Water Lilies*. To *Rock-roses* an unexpected relationship has been established by the discovery of *Dendromecon*. The greatest affinity is, however, with *Crowfoots*, from which it is sometimes extremely difficult to know this Order, without ascertaining that the juice is milky and narcotic. *Platystemon* is the connecting link between the two Orders. *Bernhardi* indeed denies that true Poppywords are universally lactescent plants, and he quotes *Hunnemannia*, *Eschscholtzia*, and *Glaucium*, as instances to the contrary; but in reality

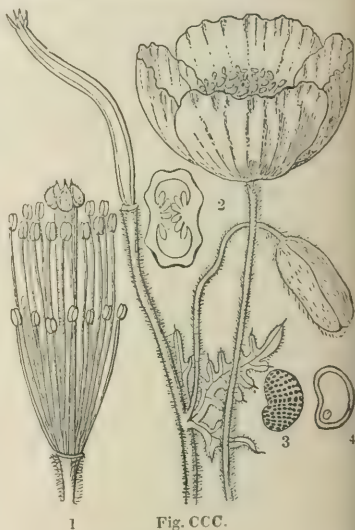


Fig. CCC.

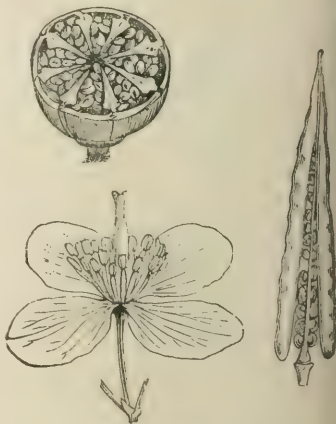


Fig. CCCL.

Fig. CCC.—*Romeria refracta*. 1. its stamens and pistil; 2. a cross section of the ovary of *Eschscholtzia californica*; 3, 4. seeds of *Papaver orientale*.  
Fig. CCCL.—Flower and fruit of *Chelidonium majus*.







ALLIANCE XXXIII. *BERBERALES*.—THE BERBERAL ALLIANCE.

DIAGNOSIS.—*Hypogynous Exogens, with monodichlamydeous flowers, unsymmetrical in the ovary, sutural, parietal, or axile placentæ, definite stamens, and embryo inclosed in a large quantity of fleshy albumen.*

The combination in the same Alliance of Epimedium and Vines, or of Fumitories and Berberries, may at first appear paradoxical. But the sequence of affinities shows that this association is truly natural. The Berberal Alliance is connected with the Ranal by means of Fumeworts, which are so nearly related to Poppyworts, that some Botanists refuse to separate them as independent Orders. The affinity of Fumitories and Epimedium with the plants generally associated with Fumeworts under the name of Nandineæ is obvious; to the latter all Botanists ally the true Berberids. The passage from Berberids proper to Vines is by no means difficult to perceive, and thence Vines may be regarded as passing into Pittosporads by means of the climbing fleshy-fruited Billardieras in the latter Order.

The characteristic marks of the Berberal Alliance are its unsymmetrical flowers, definite number of stamens, and minute embryo, lying inclosed in hard horny albumen. The only exception to this distinction is found in *Berberis* itself, whose embryo is much larger than in the remainder of the Alliance, but in that genus the long radicle and small cotyledons proclaim its relationship to be with the Orders characterised by the large quantity of their albumen. From the Erical Alliance they differ in little except the number of parts in the flower being unequal; that is to say, although the stamens, corolla, and calyx, may correspond in the number of their parts, yet the ovary is at variance with them in that respect. For this reason the Sundews are stationed here, although their habit is rather that of the Erical Alliance, to which they may be regarded as a transition. The parietal placentæ of Sundews are also in conformity with that portion of the Berberals which constitute the Fumeworts.

The true passage from Ranals is at once into Fumeworts; but Sundews being as much a modification of the structure of Poppyworts as Fumeworts themselves, the two Orders stand on the same level, and in a lineal arrangement must necessarily interfere, by the one taking a precedence to which it is not entitled.

## NATURAL ORDERS OF BERBERALS.

- |   |                     |
|---|---------------------|
| <i>Flowers regular and symmetrical. Placentæ parietal. Stamens alternate with the petals, or twice as many. . . . .</i>   | 157. DROSERACEÆ.    |
| <i>Flowers irregular and unsymmetrical. Placentæ parietal. Stamens opposite the petals . . . . .</i>  | 158. FUMARIACEÆ.    |
| <i>Flowers regular, symmetrical. Placentæ sutural. Stamens opposite the petals. Anthers with recurved valves. . . . .</i>   | 159. BERBERIDACEÆ.  |
| <i>Flowers regular, symmetrical. Placentæ axile. Stamens opposite the petals. Anthers opening longitudinally. . . . .</i>   | 160. VITACEÆ.       |
| <i>Flowers regular, symmetrical. Placentæ axile and parietal. Stamens alternate with the petals. Ovules ascending or horizontal. Corolla imbricated . . . . .</i> | 161. PITTOSPORACEÆ. |
| <i>Flowers regular, symmetrical. Placentæ axile. Stamens alternate with the petals. Ovules pendulous. Corolla valvate . . . . .</i>                               | 162. OLACACEÆ.      |
| <i>Flowers regular, symmetrical. Placentæ axile. Stamens alternate with the petals if equal to them in number. Ovules pendulous. Corolla imbricated . . . . .</i> | 163. CYRILLACEÆ.    |



## ORDER CLVII. DROSERACEÆ. SUNDEWS.

DROSERACEÆ, 10<sup>e</sup> Thénard, 214. (1819), *Prodr.* 1: 147. 1824. *Enchiridion botanicum*. Mém. 1: 30.

DIAGNOSIS. *Herbaceous Euphrasia, with regular symmetrical flowers, parietal placentæ, and stamens alternate with the petals, or twice as many.*

Delicate herbaceous plants, often covered with glands. Leaves alternate, with stipular fringes and a circinate vernation. Peduncles, when young, circinate. Sepals 5, persistent, equal, with an imbricated aestivation. Petals 5, hypogynous, imbricated.

Stamens distinct, withering, either equal in number to the petals and alternate with them, or 2, 3, or 4 times as many. Ovary single; styles 3-5, either wholly distinct, or slightly connected at the base, bifid or branched. Ovules 00, parietal, or attached to a placenta at the base, anatropal. Capsule of 3 or 5 valves, which bear the placenta either in the middle or at their base, and sometimes turn in their edges so as to form almost perfect dissepiments. Seeds either naked or furnished with an aril. Embryo minute, in the base of fleshy albumen.

These plants are generally supposed to be nearly allied to Violetworts, from which their circinate vernation, several styles, and exstipulate leaves, distinguish them. They are also no doubt related to Tutsams, among which *Parnassia* accords with Sundews. Rock roses (*Cistaceæ*) are also named as approaching Sundews, and so are Turners.

als, the parietal placentation of these Orders having led to the comparison. But if we regard the minute embryo and copious albumen of Sundews as the first point of importance in their structure, then they must be removed from immediate relation to all the Orders already mentioned, and will fall into either the *Barbarea* or *Erica* Alliance. They will correspond with the *Turner*

FIG. CCCII.

in the number of parts in their ovary not agreeing with that of the surrounding parts, and with Fumeworts in their parietal placentation; on the other hand they will bear affinity with Ericals in their general appearance. *Aldrovandea*, a water plant, inhabiting the ditches in the South of Europe, is remarkable for its whorled, cellular, shell-like leaves.

At the Cape of Good Hope, in South America, North America, New Holland, China, Europe, Madagascar, the East Indies, wherever there are marshes or meadows, these plants are found. *Drosophyllum lusitanicum* grows on the barren sands of Portugal.

The common *Drosera*s are rather acid, slightly acrid, and according to some, poisonous to cattle. The *Drosera communis* of Brazil is said by A. de St. Hilaire to be poisonous to sheep. *Drosera lunata* has viscid leaves with glandular Protophytes, which close upon

FIG. CCCII.—*Dionaea muscipula*. 1. its petal. 2. a longitudinal view of it showing the placentæ. 3. a seed: 4. the same without its crustaceous skin, and opened so as to show the embryo.

FIG. CCCIII.—*Drosera rotundifolia*. 1. a flower. 2. a longitudinal section of the ovary. 3. a perpendicular section of a seed.



flies and other insects that happen to alight upon them. It is probable it would yield a valuable dye. It is also believed that some of the Swan River species of *Drosera* might be turned to account in that way, for every part of *D. gigantea* stains paper of a brilliant deep purple, and when fragments are treated with ammonia they yield a clear yellow. The bulbs of *D. erythorhiza* and *stolonifera* have similar dyeing qualities; they have been stated by Dr. Milligan to be eatable, but that is a mistake, according to Drummond. The irritability of the glandular hairs which clothe the leaves is one of the peculiar features of the Order, and reaches its maximum in the curious genus *Dionæa*, whose leaves, bordered by stiff teeth, and divided into two halves, are furnished on each half with 3 minute bristles arranged in a triangle, which bristles are extremely irritable, and when touched cause the two sides of the leaf to collapse with such considerable force, that they cannot be separated again without employing violence: they, however, spontaneously open again in a short time.

#### GENERA.

<i>Drosera</i> , Linn.	<i>Aldrovanda</i> , Monti.	<i>Roridula</i> , Linn.
<i>Rorella</i> , Rupp.	<i>Byblis</i> , Salisb.	<i>Iridion</i> , Burm.
<i>Ros-Solis</i> , Tourm.	<i>Drosophyllum</i> , Link.	<i>Sondera</i> , Lehm.
<i>Esra</i> , Neck.	<i>Dionæa</i> , Ellis.	

NUMBERS. GEN. 7. Sp. 90.

#### *Pyrolacææ.*

POSITION.—*Fumariacææ.*—DROSERACEÆ.—*Berberidacææ.*  
*Violacææ.*

See a memoir upon this Order by M. Planchon in the *Ann. Sc. Nat.* 3 ser. IX. 79. This author reduces *Sondera* to *Drosera*.



## ORDER CLVIII. FUMARIACEÆ.—Fumariaceæ.

FUMARIACEÆ, *DC. Syst.* 2, 105, 1821, | *Poeke*, 1, 125, 1824 | *Endl. Gen. p. 166, Monoc.* 1, 1.DIAGNOSIS.—*Herbaceous European, with irregularly dissected leaves, pointed flowers, and stamens opposite the petals.*

Herbaceous plants, with brittle stems and a watery juice. Leaves usually alternate, multifid, often with tendrils. Flowers purple, white, or yellow. Sepals 2, distinct.



FIG. CCCIV.

Petals 4, cruciate, very irregular. Stamens 4, distinct, hypogynous, or 6, in 2 pairs, opposite the outer petals, very seldom all separate; anthers membranous, the outer of each parcel 1-celled, the middle one 2-celled. Ovary free, 1-celled; ovules horizontal, amphitropal; style filiform; stigma with two or more points. Fruit various, indehiscent 1- or 2-seeded nut, or a 2-valved or succulent indehiscent polyseminous pod. Seeds horizontal, shining, crested. Albumen fleshy. Embryo minute, end of the root in the indehiscent fruit straight; in those which dehisce somewhat curved.

Any one who compares *Fumaria* with *Epinehium*, or *Asarum* with *Hypomeum*, will see their very near resemblance, and thus will be led to think, what at first sight seems inadmissible, the affinity of Fumeworts and Berberids. Dr. Gussone remarks that "Fumeworts are very near Poppies, on account of their two-lobed double-calyx, of the structure of the fruit of those species in which it splits and of their fleshy albumen; but they differ, firstly, in their juice being watery, instead of milky, secondly, in their petals being usually irregular, and in adhering to each other; thirdly, in their

FIG. CCCIV.—*Fumaria officinalis*. 1, a flower seen from below. 2, the same, with the style & pistil, stamens, and a portion of the broad ovary cut off. 3, a perfectly patterned transverse section of the two at the sides should be half anthers & the fruit.



diadelphous stamens, which bear indifferently 1- and 2-celled anthers." I am, however, inclined to suspect that the floral envelopes of Fumeworts are not rightly described. I am by no means sure that it would not be more consonant to analogy to consider the parts of their flower divided upon a binary plan; thus understanding the outer series of the supposed petals as calyx, and the inner only as petals; while the parts now called sepals are perhaps more analogous to bracts; an idea which their arrangement, and the constant tendency of the outer series to become saccate at the base, which is not uncommon in the calyx of Crucifers, but never happens, as far as I know, in their petals, would seem to confirm. Of this, some further evidence may be found in the stamens. Those organs are combined in two parcels, one of which is opposite each of the divisions of the outer series, and consists of one perfect 2-celled anther in the middle and two lateral 1-celled ones: now, supposing the lateral 1-celled anthers of each parcel to belong to a common stamen, the filament of which is split by the separation of the two parcels, we shall find the number of stamens of Fumeworts to be 4, one of which is before each of the divisions of the flower; an arrangement that is precisely what we should expect in a normal flower consisting of 2 sepals and 2 petals, and the reverse of what ought to occur if the divisions of the flower were really all petals, as has been hitherto believed. M. Gay, however, objects to this view, and considers the stamens of a Fumitory to be essentially of the same nature as those of a Crucifer, and therefore truly 6 (*Ann. Sc. Nat., ser. 2.* 18. 216.), an opinion in which I am quite unable to concur, for reasons that need not be here explained. It is sufficient to say that *Hypecoum* negatives M. Gay's theory.

The economy of the sexual organs of Fumitories is remarkable. The stamens are in two parcels, the anthers of which are a little higher than the stigma; the two middle ones of these anthers are turned outwards, and do not appear to be capable of communicating their pollen to the stigma; the four lateral ones are also naturally turned outwards, but by a twist of their filament their face is presented to the stigma. They are all held firmly together by the cohesion of the tips of the flower, which, never unclosing, offer no apparent means of the pollen being disturbed, so as to be shed upon the stigmatic surface. To remedy this inconvenience, the stigma is furnished with two blunt horns, one of which is inserted between and under the cells of the anthers of each parcel, so that without any alteration of position on the part of either organ, the mere contraction of the valves of the anthers is sufficient to shed the pollen upon that spot where it is required to perform the office of fecundation. At first sight Fumeworts are entirely unlike Poppies, and common observers would scarcely suspect their close relationship. But the seeds, and very often the fruit, of these plants are so much the same, and the genus *Hypecoum* is so exactly intermediate between the two, that there is not much to object to those who look upon Fumeworts as an irregular form of Poppyworts with definite stamens. The latter circumstance, by itself, perhaps, would not be very important, but taken with the former it sanctions the propriety of regarding them as independent Natural Orders.

Fumeworts offer every gradation, from monospermous to polyspermous fruit, and between indehiscence, as in *Fumaria* itself, and dehiscence, as in *Corydalis*.

Their principal range is in the temperate latitudes of the northern hemisphere, where they inhabit thickets and waste places. Two are found at the Cape of Good Hope.

The usual character of Fumeworts is, to be scentless, a little bitter, in no degree milky, and to act as diaphoretics and aperients. The tuber of *Corydalis tuberosa* has been found to contain a peculiar alkali called *Corydalin*. *C. bulbosa* has a tuber which is somewhat aromatic, extremely bitter, slightly astringent and acrid, and was formerly used as a substitute for Birthworts in expelling intestinal worms, and as an emmenagogue. *Dicentra Cucullaria* has been employed in North America in the same way; and *Corydalis Capnoides* seems to possess similar properties.

#### GENERA.

I. <i>HYPECOEÆ</i> .—Stamens distinct.	<i>Dicentra</i> , Borkh.	<i>Phacocapnos</i> , Bernh.	<i>Leonticoides</i> , DC.
<i>Hypecoum</i> , Tournef.	<i>Dielytra</i> , DC.	<i>Corydalis</i> , DC.	<i>Disocapnos</i> , Cham. et Sch.
<i>Mnemosilla</i> , Forsk.	<i>Eucapnos</i> , Bernh.	<i>Capnogonium</i> , Bernh.	<i>Sarcocapnos</i> , DC.
<i>Chiazospermum</i> , Bernh.	<i>Capnorchis</i> , Borkh.	<i>Capnoides</i> , Boerh.	<i>Cysticapnos</i> , Boerh.
<i>Pteridophyllum</i> , Sieb.	<i>Cucullaria</i> , Raf.	<i>Neckeria</i> , Scop.	<i>Capnocystis</i> , Juss.
II. <i>FUMARIÆÆ</i> .—Stamens diadelphous.	<i>Bicucullata</i> , March.	<i>Borkhausenia</i> , Fl. Wet.	<i>Fumaria</i> , Tournef.
<i>Dactylicapnos</i> , Wall.	<i>Macrocopnos</i> , Royle.	<i>Capnites</i> , Endl.	<i>Sphaerocapnos</i> , DC.
	<i>Adlumia</i> , Raf.	<i>Bulbocapnos</i> , Bernh.	<i>Platycapnos</i> , DC.
	<i>Bicuculla</i> , Borkh.		<i>Apleurocapnos</i> , Boissier.

NUMBERS. GEN. 15. Sp. 110.

*Papaveracæ.*

POSITION.—*Droseracæ*.—*FUMARIÆÆ*.—*Berberidacæ.*

*Brassicacæ.*



## ORDEN CLIX. BERBERIDACEÆ. — Berberis.

Berberis, *Forst. Tabl. 2, 81, (1794)*; *DC. Syst. 2, 1, (1801)*; *Poir. 1, 109, 1801*; *Engelm. bot. Mexic. 6, 6.*

DIAGNOSIS. — *Berberis* *Engelm.*, with regular pentamerous flowers, petal glaucous, anthers opposite the petals, weak compound rather entire.

Shrubs or herbaceous perennial plants, for the most part barbed, but very often spiny. Leaves alternate, compound, usually without rugules. Flowers solitary, rare



FIG. CCCV.

nose or panicle. Sepals 3-4-6, deciduous, not double-roped, surrounded externally by perianth scales. Petals hypogynous, either equal to the sepals in number and opposite to them, or twice as many, sometimes with an appendage at the base to the lacinia. Stamens equal in number to the petals, and opposite to them; anthers with two lobes, opening with a valve from the bottom to the top. Carpel solitary, free, 1-ovuled; style rather lateral; stigma orbicular; ovules anatropal, attached to the parietal, intraxial, or in pairs, ascending or suspended. Fruit baccate or capsular. So the endosperm of membranous; albumen between fleshy and horny; embryo intraxial, occasionally as long as the axis of the albumen.

FIG. CCCV. — *Berberis vulgaris*. 1. stamen; 2. pistil; 3. cross section of the fruit; 4. petal; 5. sepal; 6. stamen; 7. pistil; 8. cross section of the fruit; 9. petal; 10. sepal.



Among the conflicting opinions of Botanists who have referred these plants to many different places, it appears clear that they are in fact allied, as Auguste de St. Hilairo affirmed, to Vines, with which they so nearly agree in fructification that if a Berberry had two consolidated carpels and anthers opening longitudinally it would be almost a Vine. While, however, the Berberry itself touches the Vine, some plants of its family show a very different tendency, and are so organised as to resemble very nearly the Fumeworts; these are the Sub-order Nandineæ, in which Epimedium has all the habit and much of the structure of a Fumaria. Some Botanists fancy that Podophyllum should stand here: but the main distinction between Berberids and Crowfoots consists in the recurved anther-valves of the former, and as Podophyllum has not such valves, it must go to Crowfoots. In the singular structure of their anthers there is a striking analogy with Laurels, Plume Nutmegs (Atherospermaceæ), and Witch Hazels, Orders not otherwise akin to Berberids. Caulophyllum thalictroides offers one of the few instances of seeds being absolutely naked, that is to say, not covered by any integument originating in the pericarp. In this plant the ovary is ruptured at an early stage by the expansion of the ovule, which, having been impregnated, continues to grow, and ultimately arrives at maturity, although deprived of its pericarpal covering. The spines of the common Berberry are a curious state of leaf, in which the parenchyma is absorbed, and the ribs are indurated. They, as well as all the simple leaves of the other species, are articulated with the petiole, and are therefore compound leaves reduced to a single leaflet; wherefore the supposed genus Mahonia does not differ essentially from Berberis in foliage any more than in fructification. Berberids are related to Anonads through the genus Bocagea; and their ovary is described as being sometimes strikingly like that of Davilla in Dilleniads. Some of the pinnated species of Berberis have stipules.

Natives of mountainous places in the temperate parts of the northern hemisphere, and of South America as far as the Straits of Magellan; none in Africa, Australasia, or the South Sea Islands. They are very common in the northern provinces of India.

The berries of Berberis vulgaris and other species are acid and astringent, and form with sugar an agreeable refreshing preserve. Their acid is the oxalic (malic, Royle.) The stem and bark of the Berberry are excessively astringent, and are employed for that reason by dyers, who also obtain from them a bright yellow colour. Dr. Royle has ascertained that the λυκιον ινδικον of Dioscorides was a Berberry; to this day an extract of the root, stem, and branches of Indian Berberries is employed in cases of ophthalmia, and it is said with great advantage. The fruits of B. asiatica are dried in the sun like raisins. The somewhat bitter leaves of Epimedium alpinum were formerly regarded as sudorific and alexipharmic; the same properties are ascribed to the roots of Caulophyllum thalictroides, whose seeds have been employed as a substitute for Coffee. The leaves of Bongardia Chrysogonum are eaten in the East like Sorrel. The root of Leontice Leontopetalum is used at Aleppo as a substitute for soap; and is regarded by the Turks as a corrective of overdoses of Opium. The tubers of Bongardia Rauwolfii are eaten, both boiled and roasted, in Persia.

#### GENERA.

##### § 1. BERBERIDÆ.

*Berberis*, L.  
*Mahonia*, Nutt.  
*Odestma*, Raf.

##### § 2. NANDINÆ.

*Epimedium*, L.  
*Nandina*, Thunb.  
*Leontice*, L.  
*Leontopetalum*, Tourn.

*Achlys*, DC.  
*Caulophyllum*, Michx.  
*Diphylleja*, Michx.  
*Jeffersonia*, Bart.

*Croomia*, Torrey.  
*Aceranthus*, Morren.  
*Vancouveria*, Morren.  
*Bongardia*, Meyer.

NUMBERS. GEN. 12. Sp. 100.

*Araliaceæ.*

POSITION.—Fumariaceæ.—BERBERIDACEÆ.—Vitaceæ.

*Ranunculaceæ.*

A paper on the organogenesis of this order, by M: Payer, will be found in the *Ann. Sc. Nat.*, ser. 3. XVIII. 246.



## ORDER CLX. VITACEÆ.—VINEWORTS.

*Vitis*, *Juss. Gen.* 267. (1789). — *Sambonacæ*, *Fest. Tenth.* 2. 167. (1799). — *Vitaceæ*, *Juss. Mém. Mus.* 441. (1817). — *Ampelacæ*, *Roth in H. & A. N. G. et Syn.* 222. (1821). — *Vitaceæ*, *W. & A.* (1824). — *Encl. Gen. clxvi.* — *Mosses Gen.* 51; *Wright Faun.* 1. 146; *Rafin. Faun.* 144. — *Linnaeus, Botching Ord. Nat.* p. 364. 1830.

**DIAGNOSIS.**—*Herbaceous Enceps, with regular asymmetrical flowers, axils pinnate, stamens opposite the petals, and anthers opening longitudinally.*

Scrambling, climbing shrubs, with tumid separable joints, or erect bushes; the woody tissue abounds with dotted ducts of large size, which, at certain seasons, pour forth sap in unusual quantity. Leaves with or without stipules at the base, the lower opposite, the upper alternate, simple or compound. Peduncles racemose, sometimes by abortion changing to tendrils, often opposite the leaves. Flowers small, green, arranged in thyrses, umbels, or panicles. Calyx small, nearly entire at the edge. Petals 4 or 5, inserted on the outside of a disk surrounding the ovary; in aestivation turned inwards at the edge, in a valvate manner, and often inflexed at the point. Stamens equal in number to the petals, and opposite them, inserted upon the disk, sometimes sterile by abortion; filaments distinct, or slightly cohering at the base; anthers ovate, versatile. Ovary superior, 2-6-celled; style 1, very short; stigma simple; ovules erect, definite, anatropal. Berry round, often by abortion 1-celled, pulpy. Seeds 4 or 5, or fewer by abortion, bony, erect; albumen hard; embryo erect, about one-third the length of the albumen; radicle inferior.

The main point of distinction in this Order is, independently of general facts, the stamens being opposite the petals; and by this circumstance it is known among its allies in the same way as Rhamnads, Primworts, &c., among theirs; and, perhaps, Vines ought to be regarded as having a certain amount of relation to Rhamnads, though they have none to Primworts. They have, however, other very strong, though not direct affinities. If the Vine is compared with *Aralia racemosa*, the relationship of the present Order to it will be too obvious to be mistaken. Suppose that *Aralia racemosa* had an adherent calyx, erect ovules, with stamens opposite the petals, and it would be a *Vitis*. A remarkable character in Umbellifers is their petals turned inwards at the points; this occurs also in *Ampelopsis quinquefolia*; in foliage there is no material difference between them, and even a trace of similarity between the sensible properties of *Vincetoxicum* and *Urtica*. The properties of fers may be perceived in the acriid berries of some species of *Cornus*. The propriety of placing *Leea* along with *Vinceworts* has been questioned, and that plant has either been referred absolutely to Meliads, or erected into a distinct Order, as by Von Martius.



FIG. CCCVI.

Fig. CCCVI.—*Vitis vinifera*. 1. a flower; 2. the same, casting its petals; 3. the pistil and stamens; 4. a section of the ovary; 5. of the seed.



Adrien de Jussieu has, however, in his Dissertation upon Meliads, satisfactorily shown (p. 33) that the genus ought not to be divided from Vineworts. The tumid joints, which separate from each other by an articulation, along with the many other points of agreement in their fructification, approximate the Order to Cranesbills; the habit and inflorescence to Caprifolds, through Hedera. The tendrils of the Order are the branches of inflorescence, the flowers of which are abortive. A singular variety of *Vitis vinifera*, with capsular fruit and loculicidal dehiscence, is described in the *Linnaea*, 5. 493. One of the most curious of all plants is *Pterisanthes*, which bears innumerable flowers on a thin flattened wing-like receptacle. It is well figured and described in the *Linnaea*, vol. 1844. t. viii.

The species are inhabitants of woods in the milder and hotter parts of both hemispheres, especially in the East Indies. None are wild in Europe. As to the Grape Vine, which follows the steps of civilised man everywhere, it is considered certain that its native country is the shores of the Caspian, in lat. 37°, where it is called Dewaz. But it is worth inquiry whether the *Vitis indica* is not also a wild form of the same plant. For much information regarding these matters, see *Royle*, in the place above quoted.

Acid leaves, and a fruit like that of the common Grape, are the usual characters of this Order. The sap or tears of the Vine are a popular remedy in France for chronic ophthalmia, but they are of little value. The leaves, on account of their astringency, are sometimes used in diarrhoea. But the dried fruit, called Raisins and Currants (Corinths), and wine, are the really important products of the Grape; products which are, however, yielded by no other of the Order, if we except the Fox-grapes of North America, which scarcely deserve to be excepted. The acid of Grapes is chiefly the tartaric; malic acid, however, exists in them. The sugar contained in Grapes differs slightly from common sugar in composition, containing a smaller quantity of carbon. The leaves of *Cissus cordata* and *C. setosa* are described as being acrid, and useful in bringing indolent tumours to suppuration. The berries of the latter are also acrid, as indeed are those of some other species. Both leaves and fruit of *Cissus tinctoria* abound in a green colouring matter, which soon becomes blue, and is highly esteemed by the Coroados and other Brazilian Indians as a dye for cotton fabrics.—*Martius*.

#### GENERA.

I. VITEÆ.—Petals distinct. Stamens distinct. Ovules in pairs. Tendrils.

*Cissus*, Linn.  
*Solanthus*, Forsk.  
*Columellia*, Lour.  
*Botria*, Lour.  
*Cayratia*, Juss.  
*Ingenhousia*, Dennst.  
*Irsiola*, P. Br.  
*Ampelopsis*, L. C. Rich.  
*Vitis*, Linn.  
*Pterisanthes*, Blum.

II. LEEÆ.—Petals united at base. Stamens monadelphous. Ovules solitary. Tendrils 0.

*Leea*, Linn.  
*Aquilicia*, Linn.  
*Otilis*, Gärtn.  
 ? *Geruma*, Forsk.  
 ? *Lasianthera*, Palis.  
 ? *Bersama*, Fresen.  
*Rhaganus*, Men.  
*Natalia*, Hochst.

NUMBERS. GEN. 7. Sp. 260.

*Araliaceæ.*

POSITION.—Berberidaceæ.—VITACEÆ.—Pittosporaceæ.  
*Rhamnaceæ.*

The genus *Pterisanthes*, carefully described and illustrated by Miquel (*Linnaea*, XVIII. 385), is a most curious plant, related to *Cissus*, with a large thin foliaceous lobed rachis, bearing on the edge long-stalked sterile flowers, and on the surface sessile hermaphrodite ones; it seems to be analogous to the expanded rachis of *Dorstenia*.



## ORDER CLXI. PITTOSPORACEÆ.—PITTOSPORACEÆ.

Pittosporaceæ, *R. Brown in Fendler's Voyag.*, 2: 312 (1831). — *Presl, Fendler's Voyag.*, 4th. fasc., *Bot. Voyag.* 12, 343 (1828); *Reichb. den. exsicc.*, *Monach.*, fasc. 30, Pittosporaceæ, *Botan. Voyag.*, 1832.

DIAGNOSIS.—*Herbaceous* *Woody*, with regular opposite or whorled flowers, rarely with pedicels; petals alternate with the petals, sometimes or sometimes united, sometimes united.

Trees or shrubs. Leaves simple, alternate, without stipules, usually entire, sometimes serrated. Flowers terminal or axillary,  $\frac{1}{2}$ , with unilateral aestivation. Sepals 5, deciduous, either distinct or partially cohering. Petals 4-5, hypogynous, sometimes slightly cohering. Stamens 5, hypogynous, distinct, alternate with the petals. Anthers two-celled, opening longitudinally or by a pore. Ovary single, distinct, with the cells of the placenta 2 or more in number, and many seeded; style 1; stigma equal in number to the placenta; ovules horizontal or ascending, anatropal. Fruit capsular or berry, with many seeded cells, which are sometimes leucophyllous. Seeds often covered with a glutinous or resinous pulp; embryo minute, near the hilum, lying in fleshy albumen; radicle rather long; cotyledons very short.

Brown, in establishing this as an Order, remarks that it is widely different from Rhamnads and Spindletrees, but he seems to have been unable to point out its real affinity; De Candolle places it between Milkworts and Frankeniads; according to Achille Richard, it is very near Rueworts, to which he thinks it allied by a crowd of characters. Endlicher puts it into his Frangulaceæ group. To me, however, it appears that the great mass of albumen in the seeds, the minute embryo, and the general accordance of the flowers with the structure of Vineworts, which is further established by the succulent fruit and climbing habit of *Billardiera*, seem to place Pittosporads in the same Alliance as the Vine and Berry. The little genus *Choranthus* forms a transition from Pittosporads to Dilleniads, at once obvious and unexpected.

Chiefly New Holland plants. A few occur in Africa and the adjacent islands, and one in Nipal. Brown remarks that Pittosporum itself has been found not only in New Holland, but also in New Zealand, Norfolk Island, the Society and Sandwich Islands, the Moluccas, China, Japan, and even Malabar. They seem to be unknown in America.

The berries of *Billardiera* are eatable; but they have a resinous taste, and a little subacid taste. The bark of *Pittosporum* *Volkm.* has a resinous smell, and this resinous quality seems very general in the Order. Mr. Baillon states that *Billardiera* *pauciflora* has a green cylindrical fruit, becoming of a lighter green or yellow colour, when ripe, possessing a pleasant subacid taste; but the seeds are numerous and hard.

## GENERA.

<i>Choranthus</i> , A. Commers.	<i>Marganthera</i> , Brand.	<i>Conospermum</i> , Don.	<i>Sagittaria</i> , Desf.
<i>Pittosporum</i> , Schrad.	<i>Choranthus</i> , Commers.	<i>Hemiphysalis</i> , Smith.	<i>Choranthus</i> , Desf.
<i>Sagittaria</i> , L.	<i>Sagittaria</i> , L.	<i>Leptocarpus</i> , Hook.	
<i>Billardiera</i> , Cav.	<i>Billardiera</i> , Hook.		
<i>Oncospermum</i> , Poir.	<i>Spiranthes</i> , Willd.		

NUMBERS, GEN. 17. SP. 17.

*Herbaceous*

POSITION.—*Woody*—PITTOSPORACEÆ—*Woody*

*Herbaceous*

FIG. CCVII.—1. *Choranthus*, *pauciflora*, 2. *Billardiera*, *pauciflora*, 3. A seed (magnified 10 times) of *Billardiera*, 4. A seed of *Pittosporum* *undulatum*, not given to show the minute embryo.



CANELACEÆ, (*Von Martius, Nov. Gen. et Sp.* 3. 163. (1829); *Conspectus*, No. 300. (1835); *Ed. pr. under Guttifera*, p. 75, *Endl. Gen.* p. 1029). This name has been given to a supposed Order of plants represented by *Canella alba*, a common West Indian aromatic shrub, with evergreen, coriaceous, obovate, alternate, stalked leaves, no stipules, and corymbs of purple flowers. The calyx is leathery, and consists of 3 blunt, tough, permanent, concave sepals, which imbricate each other. The petals are 5, twisted in æstivation. Within these stands a tough truncated hypogynous cone, whose upper half, on the outside, bears about 20 linear parallel 2-celled anthers, which open longitudinally and touch each other. Its ovary is ovate, and tapers into a stiff style, whose end is emarginate. According to Botanical writers, the stigma is permanent and 2-lobed, while the ovary is 3-celled, with more ovules than one attached to the central angle. But I can find no such structure; on the contrary, although the stigma is very slightly emarginate, yet the ovary does not offer a trace of even two cells, but is absolutely one-celled, with 2 or 3 half anatropal ovules hanging by long cords from a little below the dome of the cavity. Gærtner has figured what purports to be the fruit of this plant, representing it to have 3 cells, of which 2 are abortive, and 2 or 3 seeds in the perfect cell, somewhat rostrate, consisting of hard homogeneous albumen, and containing a very small curved cylindrical embryo, lying obliquely with the radicle turned towards the rostrum. But this fruit can hardly belong to *Canella alba*, if it is correctly drawn; and yet, from the appearance of the calyx in Gærtner's figure, and from his having obtained his fruits out of the Banksian collection, one can scarcely doubt that they really do belong to *Canella*; in which case we may assume that the seed-vessel has been incorrectly observed. Upon this supposition *Canella* can have nothing to do with *Guttifers*, from which in fact its alternate leaves and general appearance remove it. Nor can it be possibly associated, as Martius proposes, with *Platonia*, a Brazilian tree with the look of a *Clusia*; neither is it by any means clear that the *Canella axillaris* of Nees, now called *Cinnamodendron*, is allied to it. However, as I have had no opportunity of examining the fruit of *Canella*, or of seeing *Cinnamodendron*, it must be enough to suggest that the plants referred to *Canellaceæ* are much more like *Pittosporum* than *Clusia*, and to refer the question of their real place in the natural system to Botanists who possess the means of studying both in all their details. *Canella alba* is often called Wild Cinnamon in the West Indies, on account of its warm aromatic fragrant qualities. Its bark yields by distillation a warm aromatic oil, reckoned carminative and stomachic. It is often mixed with oil of cloves in the West Indies. In this country it is principally employed as an aromatic addition either to tonics or purgatives in debilitated conditions of the digestive organs. *Canella* bark has also been employed in scurvy. It is exported in considerable quantities from the Bahamas, under the name of White Wood Bark, and is so called in consequence of the whiteness of the trees after they have been stripped. It is only the inner smooth white bark that is exported, the rough outside rind being easily separated by beating. *Cinnamodendron axillare*, a Brazilian tree, is also aromatic; its bark is used with success as a tonic and antiscorbutic; it is prescribed in low fevers, and is made into gargles in debility of the tonsils.

#### GENERA.

*Canella*, P. Br.

*Winterania*, Linn.

?*Cinnamodendron*, Endl.

#### NUMBERS. GEN. 2. Sp. 3.

A. Richard has described *Canella* in his *Flore de Cuba*, p. 245. He confirms the above statements as regards the structure of the ovary; except that he says it contains 6 funiculate ovules attached in pairs to the middle of the wall of the ovary, at the same height. The seed he finds constructed as Gærtner describes it, although that author was wrong about the fruit. Finally, he suggests an affinity with *Ternstromiads*, in which I am unable to concur. *Canella* is certainly much nearer *Oleacads*.



## ORDER CLXII. OLACACEÆ.—OLACACEÆ.

*Olacaceæ*. *Michx.* *Bull. Pichon* n. 78, 79 (1861); *Dr. Fourn.* 1, and (1861); *Brongn.* *Icon. bot.* 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

*Diagnosis.*—*Botanical Pigeons*, with regular unsymmetrical flowers, small perianth, numerous alternate with the petals, pendulous ovules, and minute anthers.

Trees or shrubs, often spiny. Leaves simple, alternate, entire without stipules, or occasionally altogether wanting (rarely compound). Flowers small, cymose, axillary, or terminal. Calyx small, entire, or slightly toothed, finally becoming, in many cases, enlarged. Petals distinct, hypogynous, valvate in aestivation, either altogether separate, or cohering in pairs by the intervention of stamens, often having thick matted hairs along the middle vein or on some other part. Stamens usually part fertile, part sterile; the former varying in number from 3 to 16, hypogynous, usually cohering with the petals, and alternate with them; the latter opposite the petals, to which they in part adhere, their upper end resembling an appendage; filaments com-



FIG. CCXVII. 14.

pressed; anthers imbricate, oblong, 2-celled, bursting longitudinally. Ovary free, or partially adherent, seated in a disk, which is sometimes small and sometimes thickened and united with the calyx; 1-celled, or occasionally imperfectly 2-4-celled, or 3-celled out of the centre; ovules 2, 3 only, or even 1 only, either pendulous from the apex of free placenta or adherent to the ovary or the spurious disciformity, pendulous, anatropal.—*Boeckl.* Style filiform, stigma simple. Fruit somewhat drupaceous, indehiscent, frequently surrounded by the enlarged calyx, 1-celled, 1-seeded. Seed pendulous; albumen large, fleshy; embryo small, in the base of albumen or in the axis, with very short cotyledons, its radicle near the hilum.

If we neglect the internal structure of the seed the present Order will stand, as DeCandolle supposes, near Citræworts: if we suppose the tendency of the corolla to be towards a monopetalous condition with epipetalous stamens, then it must be stationed, with Jussieu, near Sapotads; those who undervalue the perfect cohesion of the calyx and the ovary will pronounce the nearest affinity to be with Sandwicheæ, but if the condition of the embryo and albumen are considered, a very different view will be entertained of its affinity, and Hameliads, if they really have a small embryo and copious albumen, will be fixed upon as the true point of nearest relationship. To the latter opinion I adhere; and I am glad to find that Mr Bentham goes in for it. In fact, if it were not for the great dilated connective of the Hameliads, their somewhat imbricated corolla, more numerous stamens and balsamic secretions I hardly know how they could be distinguished. They obviously agree with the Eucleæ. A theory of the mismerous structure of their flowers, and must be regarded as one of the same order, if indeed that supposed Order does not in reality belong to them. See p. 442.

A small Order, consisting of tropical or nearly tropical shrubs, chiefly found in the East Indies, New Holland, and Africa. One only is known in the West Indies. A few are from the Cape of Good Hope.

It is often said that the wood of *Holbertia excelsa* is the Partridge-wood of the cabinet-makers, but this is certainly a mistake, as is shown in the *Journal of Botany*, article Partridge-wood. The drupes of *Ximelia americana* have a sweet aromatic taste, but are a little rough to the palate. They are used in Siam. The leaves are very sweet scented. *Olax mylana* has a fragrant wood with a saline taste and is employed in putrid fevers; its leaves are used in India.

For the following additional remarks I am indebted to Mr. Meisner. Some details of the structure of *Larionna*, and of the singular genus *Cutanea*, together with a series

FIG. CCXVII. 15.—*Olax mylana*. 1. Longitudinal section of a flower bud with calyx; 2. Ovary with the ovules removed to show the transverse shape of the ovules and style; 3. Seed surrounded by calyx; 4. Seed with two distinct lobes; 5. Longitudinal section of a flower bud showing the structure of the ovary.



of observations on the affinities of this Order, have lately been published by me. From what has already been shown, we learn that other good distinctions are derived from the peculiar modification of the disk; and we are led to better notions of the real affinities of the Order, by a more exact knowledge of the structure of the ovarium and fruit. According to these views, the tribe Icacinæ *Benth.* must be altogether separated from the family, and for the reasons quoted in the next page, established as a distinct order. The Olacaceæ, thus limited, are characterised in the following manner:—Trees or shrubs with alternate, entire, coriaceous leaves, without stipules; flowers small, generally fragrant, hermaphrodite, or polygamous, in close axillary panicles or corymbs. Calyx small, cup-shaped, entire, or slightly toothed, persistent, sometimes becoming considerably enlarged with the fruit. Petals generally 5, rarely 6, oblong, valvate in æstivation, with the summits apiculated and inflexed, margins sometimes adhering at base into a tubular form by the agglutination of the stamens, or often cohering in pairs by their margins nearly to the summit, from the same cause, frequently furnished with hairs inside. Stamens 5 to 10, generally partly sterile, fertile 3 to 10, of which 5 or fewer are always opposite the petals; the sterile, generally alternate with them, are appendiciform; filaments shorter than petals, free in bud, but afterwards often partially agglutinated to them by a nectariferous exudation: these are always inserted either upon the elevated external margin, or outside of the conspicuous disk; anthers innate, oblong, 2-lobed, bursting longitudinally. Ovary seated within the disk, which in *Opilia* is divided into 5 fleshy, linear lobes, alternate with the petals; but in all other genera this disk expands into a cup-shaped nectary, which is sometimes free from the ovary, and partially adnate to the calyx, but more often wholly confluent with the ovary, and free from the calyx, rarely free from both the ovary and the calyx: when this assumes a cup-shape, the petals and stamens are borne on the external portion of its limb. Ovary always quite superior to the calyx, but often imbedded in the disk, frequently surmounted by a remarkable fleshy epigynous gland, that sometimes covers its upper moiety, always unilocular at the summit, and incompletely 2- to 5-locular at base, the placenta arising in a free column from the axile line of junction of the incomplete dissepiments, and erect in the summit, and sometimes extending into a cavity of the style, but always free. Ovules generally one in each pseudo-cell, all pendulous from the free central placenta. Style simple; stigma more or less clavate or imperfectly 2- to 5-lobed. Fruit somewhat drupaceous, frequently enveloped by the enlarged ventricose calyx, and enclosing an indehiscent unilocular 1-seeded osseous putamen. Seed exutive, or wanting all integumental covering, apparently suspended by a raphe-like thread proceeding from the base to the summit of the cell, which, as in *Santalaceæ*, is the withered remanet of the dissepiments and placental column. Albumen fleshy, having in the summit of its axis a small embryo with short cotyledons and a superior terete radicle.

“From the above characters, it is evident that the nearest affinity of the Olacaceæ is to the *Santalaceæ* on the one hand, and to the *Styraceæ* and *Humiriaceæ* on the other. The *Santalaceæ* differ only from the Olacaceæ in the confluence of the calyx and corolla into a more or less complete perigonium, and of this with the disk and ovary in a more or less perfect degree. All those genera of the *Santalaceæ* possessing distinctly dichlamydeous flowers are therefore by me referred to Olacaceæ, with which they accord in all essential respects. *Causjera* is rejected from the order, its position being near *Thymelaceæ*.

“I have also proposed to form a distinct alliance (the *Cionospermeæ*) for those families with polypetalous flowers, having a calyx generally free, sometimes confluent with the corolla; petals sometimes united at base by partial agglutination of the filaments; stamens, though often adherent to the petals, always originate from the external surface of the disk; an ovarium, with a simple style and stigma, is always unilocular at summit, with ovules attached to a free central placenta, which he calls a *Cionosperm*. Seeds either indutive, or exutive,\* i.e. with or without the usual integumental coverings. This alliance will comprise, first, those families having indutive seeds, viz., *Myrsinaceæ*, *Theophrastaceæ*, *Styraceæ*, *Humiriaceæ*, *Ægiceraceæ*, and perhaps *Aptandraceæ*; second, those with exutive seeds, viz., *Olacaceæ*, *Santalaceæ*, and *Viscaceæ*. The principle upon which this alliance is founded, proceeds on the basis that we should look to the phenomena of the development of the reproductive organs of plants as the ground on which all natural methods of

\* This expression is preferred to that of *naked* seeds, the application of which term, having been made in various significations, might lead to confusion; it has been used for the seeds of the *Coniferae*; it has been applied by Linnaeus to the gynobasic seeds of the *Labiatae*; it has been adapted to instances like the present, and was employed by Bartling to denote the absence of the vitellus around a seed.—*J. M.*



classification should be established. Thus, according to present evidence, the development of a plurilocular ovary is due to the union of the plurilocular margins of several carpellary leaves, and these with parietal placentation are owing to the junction of the avicularious edges of the component carpels. On this same principle we may conceive other degrees of development, in which the margins of the carpellary leaves being entire, the lower portions of their edges and their parietal supports alone are present forms. Under this hypothesis, the result would be the development of placentae, either wholly free, or partially continued with integumental dissepiments, and the position of the families so constructed would find their place between those instances, where distinct carpels are largest, and those where parietal carvies are supported upon an elevated gynobium or between Berberidaceae and Urticariaceae as above suggested.

## CONCLUSION

[illegible]

<sup>10</sup>NOTES. CHN, 23.85%; S, 1.11%.

POSITION.—Santalaloe—OLIVAR—SANTALALOE  
(*Amelanchier*).

## \*ICACINACEE

*Footnote Mark: Are Not the last set 8 (17) - except 11, which is 17 - and 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26 - 27 - 28 - 29 - 30 - 31 - 32 - 33 - 34 - 35 - 36 - 37 - 38 - 39 - 40 - 41 - 42 - 43 - 44 - 45 - 46 - 47 - 48 - 49 - 50 - 51 - 52 - 53 - 54 - 55 - 56 - 57 - 58 - 59 - 60 - 61 - 62 - 63 - 64 - 65 - 66 - 67 - 68 - 69 - 70 - 71 - 72 - 73 - 74 - 75 - 76 - 77 - 78 - 79 - 80 - 81 - 82 - 83 - 84 - 85 - 86 - 87 - 88 - 89 - 90 - 91 - 92 - 93 - 94 - 95 - 96 - 97 - 98 - 99 - 100 - 101 - 102 - 103 - 104 - 105 - 106 - 107 - 108 - 109 - 110 - 111 - 112 - 113 - 114 - 115 - 116 - 117 - 118 - 119 - 120 - 121 - 122 - 123 - 124 - 125 - 126 - 127 - 128 - 129 - 130 - 131 - 132 - 133 - 134 - 135 - 136 - 137 - 138 - 139 - 140 - 141 - 142 - 143 - 144 - 145 - 146 - 147 - 148 - 149 - 150 - 151 - 152 - 153 - 154 - 155 - 156 - 157 - 158 - 159 - 160 - 161 - 162 - 163 - 164 - 165 - 166 - 167 - 168 - 169 - 170 - 171 - 172 - 173 - 174 - 175 - 176 - 177 - 178 - 179 - 180 - 181 - 182 - 183 - 184 - 185 - 186 - 187 - 188 - 189 - 190 - 191 - 192 - 193 - 194 - 195 - 196 - 197 - 198 - 199 - 200 - 201 - 202 - 203 - 204 - 205 - 206 - 207 - 208 - 209 - 210 - 211 - 212 - 213 - 214 - 215 - 216 - 217 - 218 - 219 - 220 - 221 - 222 - 223 - 224 - 225 - 226 - 227 - 228 - 229 - 230 - 231 - 232 - 233 - 234 - 235 - 236 - 237 - 238 - 239 - 240 - 241 - 242 - 243 - 244 - 245 - 246 - 247 - 248 - 249 - 250 - 251 - 252 - 253 - 254 - 255 - 256 - 257 - 258 - 259 - 260 - 261 - 262 - 263 - 264 - 265 - 266 - 267 - 268 - 269 - 270 - 271 - 272 - 273 - 274 - 275 - 276 - 277 - 278 - 279 - 280 - 281 - 282 - 283 - 284 - 285 - 286 - 287 - 288 - 289 - 290 - 291 - 292 - 293 - 294 - 295 - 296 - 297 - 298 - 299 - 300 - 301 - 302 - 303 - 304 - 305 - 306 - 307 - 308 - 309 - 310 - 311 - 312 - 313 - 314 - 315 - 316 - 317 - 318 - 319 - 320 - 321 - 322 - 323 - 324 - 325 - 326 - 327 - 328 - 329 - 330 - 331 - 332 - 333 - 334 - 335 - 336 - 337 - 338 - 339 - 340 - 341 - 342 - 343 - 344 - 345 - 346 - 347 - 348 - 349 - 350 - 351 - 352 - 353 - 354 - 355 - 356 - 357 - 358 - 359 - 360 - 361 - 362 - 363 - 364 - 365 - 366 - 367 - 368 - 369 - 370 - 371 - 372 - 373 - 374 - 375 - 376 - 377 - 378 - 379 - 380 - 381 - 382 - 383 - 384 - 385 - 386 - 387 - 388 - 389 - 390 - 391 - 392 - 393 - 394 - 395 - 396 - 397 - 398 - 399 - 400 - 401 - 402 - 403 - 404 - 405 - 406 - 407 - 408 - 409 - 410 - 411 - 412 - 413 - 414 - 415 - 416 - 417 - 418 - 419 - 420 - 421 - 422 - 423 - 424 - 425 - 426 - 427 - 428 - 429 - 430 - 431 - 432 - 433 - 434 - 435 - 436 - 437 - 438 - 439 - 440 - 441 - 442 - 443 - 444 - 445 - 446 - 447 - 448 - 449 - 450 - 451 - 452 - 453 - 454 - 455 - 456 - 457 - 458 - 459 - 460 - 461 - 462 - 463 - 464 - 465 - 466 - 467 - 468 - 469 - 470 - 471 - 472 - 473 - 474 - 475 - 476 - 477 - 478 - 479 - 480 - 481 - 482 - 483 - 484 - 485 - 486 - 487 - 488 - 489 - 490 - 491 - 492 - 493 - 494 - 495 - 496 - 497 - 498 - 499 - 500 - 501 - 502 - 503 - 504 - 505 - 506 - 507 - 508 - 509 - 510 - 511 - 512 - 513 - 514 - 515 - 516 - 517 - 518 - 519 - 520 - 521 - 522 - 523 - 524 - 525 - 526 - 527 - 528 - 529 - 530 - 531 - 532 - 533 - 534 - 535 - 536 - 537 - 538 - 539 - 540 - 541 - 542 - 543 - 544 - 545 - 546 - 547 - 548 - 549 - 550 - 551 - 552 - 553 - 554 - 555 - 556 - 557 - 558 - 559 - 560 - 561 - 562 - 563 - 564 - 565 - 566 - 567 - 568 - 569 - 570 - 571 - 572 - 573 - 574 - 575 - 576 - 577 - 578 - 579 - 580 - 581 - 582 - 583 - 584 - 585 - 586 - 587 - 588 - 589 - 590 - 591 - 592 - 593 - 594 - 595 - 596 - 597 - 598 - 599 - 600 - 601 - 602 - 603 - 604 - 605 - 606 - 607 - 608 - 609 - 610 - 611 - 612 - 613 - 614 - 615 - 616 - 617 - 618 - 619 - 620 - 621 - 622 - 623 - 624 - 625 - 626 - 627 - 628 - 629 - 630 - 631 - 632 - 633 - 634 - 635 - 636 - 637 - 638 - 639 - 640 - 641 - 642 - 643 - 644 - 645 - 646 - 647 - 648 - 649 - 650 - 651 - 652 - 653 - 654 - 655 - 656 - 657 - 658 - 659 - 660 - 661 - 662 - 663 - 664 - 665 - 666 - 667 - 668 - 669 - 670 - 671 - 672 - 673 - 674 - 675 - 676 - 677 - 678 - 679 - 680 - 681 - 682 - 683 - 684 - 685 - 686 - 687 - 688 - 689 - 690 - 691 - 692 - 693 - 694 - 695 - 696 - 697 - 698 - 699 - 700 - 701 - 702 - 703 - 704 - 705 - 706 - 707 - 708 - 709 - 710 - 711 - 712 - 713 - 714 - 715 - 716 - 717 - 718 - 719 - 720 - 721 - 722 - 723 - 724 - 725 - 726 - 727 - 728 - 729 - 730 - 731 - 732 - 733 - 734 - 735 - 736 - 737 - 738 - 739 - 740 - 741 - 742 - 743 - 744 - 745 - 746 - 747 - 748 - 749 - 750 - 751 - 752 - 753 - 754 - 755 - 756 - 757 - 758 - 759 - 760 - 761 - 762 - 763 - 764 - 765 - 766 - 767 - 768 - 769 - 770 - 771 - 772 - 773 - 774 - 775 - 776 - 777 - 778 - 779 - 780 - 781 - 782 - 783 - 784 - 785 - 786 - 787 - 788 - 789 - 790 - 791 - 792 - 793 - 794 - 795 - 796 - 797 - 798 - 799 - 800 - 801 - 802 - 803 - 804 - 805 - 806 - 807 - 808 - 809 - 810 - 811 - 812 - 813 - 814 - 815 - 816 - 817 - 818 - 819 - 820 - 821 - 822 - 823 - 824 - 825 - 826 - 827 - 828 - 829 - 830 - 831 - 832 - 833 - 834 - 835 - 836 - 837 - 838 - 839 - 840 - 841 - 842 - 843 - 844 - 845 - 846 -*

Evergreen trees and shrubs. Leaves alternate, simple, without stipules. Flowers generally  $\frac{1}{2}$ , or occasionally  $\frac{3}{4}$ , by abortion, usually small and disposed in axillary or terminal cymes or panicles, each distinctly articulated on its short bracteated pedicel. Calyx small, cup-shaped, 5 rarely 4-toothed, persistent. Corolla hypogynous, of 5, rarely of 4 or 6 petals, valvate in aestivation, and sometimes cohering at base by the adhesion of the filaments into a short tube, fleshy in texture, with the apical points much inflexed, sometimes clothed inside with long hairs. Stamens equal in number to the petals, always alternate with them, nearly equal to them in length; anthers introrse, 2-lobed, each lobe 2-celled, bursting by a longitudinal opening along the septum of the cells. Disk cup-shaped, surrounding the base of the ovarium, sometimes quite free from it, often partially adnate. Ovarium formed normally of 5 cells, sometimes 3-celled, excentrically disposed, rarely 2-celled, generally 1-locular, surmounted by a subovoid apocarpous stam-



They observed:

Fig. 10. *CCV* III—A) lytes dimidiata, 1) 1st larva; 2) 2nd larva; 3) 3rd larva; 4) 4th larva; 5) 5th larva; 6) 6th larva; 7) 7th larva; 8) 8th larva; 9) 9th larva; 10) 10th larva; 11) 11th larva; 12) 12th larva; 13) 13th larva; 14) 14th larva; 15) 15th larva; 16) 16th larva; 17) 17th larva; 18) 18th larva; 19) 19th larva; 20) 20th larva; 21) 21st larva; 22) 22nd larva; 23) 23rd larva; 24) 24th larva; 25) 25th larva; 26) 26th larva; 27) 27th larva; 28) 28th larva; 29) 29th larva; 30) 30th larva; 31) 31st larva; 32) 32nd larva; 33) 33rd larva; 34) 34th larva; 35) 35th larva; 36) 36th larva; 37) 37th larva; 38) 38th larva; 39) 39th larva; 40) 40th larva; 41) 41st larva; 42) 42nd larva; 43) 43rd larva; 44) 44th larva; 45) 45th larva; 46) 46th larva; 47) 47th larva; 48) 48th larva; 49) 49th larva; 50) 50th larva; 51) 51st larva; 52) 52nd larva; 53) 53rd larva; 54) 54th larva; 55) 55th larva; 56) 56th larva; 57) 57th larva; 58) 58th larva; 59) 59th larva; 60) 60th larva; 61) 61st larva; 62) 62nd larva; 63) 63rd larva; 64) 64th larva; 65) 65th larva; 66) 66th larva; 67) 67th larva; 68) 68th larva; 69) 69th larva; 70) 70th larva; 71) 71st larva; 72) 72nd larva; 73) 73rd larva; 74) 74th larva; 75) 75th larva; 76) 76th larva; 77) 77th larva; 78) 78th larva; 79) 79th larva; 80) 80th larva; 81) 81st larva; 82) 82nd larva; 83) 83rd larva; 84) 84th larva; 85) 85th larva; 86) 86th larva; 87) 87th larva; 88) 88th larva; 89) 89th larva; 90) 90th larva; 91) 91st larva; 92) 92nd larva; 93) 93rd larva; 94) 94th larva; 95) 95th larva; 96) 96th larva; 97) 97th larva; 98) 98th larva; 99) 99th larva; 100) 100th larva; 101) 101st larva; 102) 102nd larva; 103) 103rd larva; 104) 104th larva; 105) 105th larva; 106) 106th larva; 107) 107th larva; 108) 108th larva; 109) 109th larva; 110) 110th larva; 111) 111st larva; 112) 112nd larva; 113) 113rd larva; 114) 114th larva; 115) 115th larva; 116) 116th larva; 117) 117th larva; 118) 118th larva; 119) 119th larva; 120) 120th larva; 121) 121st larva; 122) 122nd larva; 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179) 179th larva; 180) 180th larva; 181) 181st larva; 182) 182nd larva; 183) 183rd larva; 184) 184th larva; 185) 185th larva; 186) 186th larva; 187) 187th larva; 188) 188th larva; 189) 189th larva; 190) 190th larva; 191) 191st larva; 192) 192nd larva; 193) 193rd larva; 194) 194th larva; 195) 195th larva; 196) 196th larva; 197) 197th larva; 198) 198th larva; 199) 199th larva; 200) 200th larva; 201) 201st larva; 202) 202nd larva; 203) 203rd larva; 204) 204th larva; 205) 205th larva; 206) 206th larva; 207) 207th larva; 208) 208th larva; 209) 209th larva; 210) 210th larva; 211) 211st larva; 212) 212nd larva; 213) 213rd larva; 214) 214th larva; 215) 215th larva; 216) 216th larva; 217) 217th larva; 218) 218th larva; 219) 219th larva; 220) 220th larva; 221) 221st larva; 222) 222nd larva; 223) 223rd larva; 224) 224th larva; 225) 225th larva; 226) 226th larva; 227) 227th larva; 228) 228th larva; 229) 229th larva; 230) 230th larva; 231) 231st larva; 232) 232nd larva; 233) 233rd larva; 234) 234th larva; 235) 235th larva; 236) 236th larva; 237) 237th larva; 238) 238th larva; 239) 239th larva; 240) 240th larva; 241) 241st larva; 242) 242nd larva; 243) 243rd larva; 244) 244th larva; 245) 245th larva; 246) 246th larva; 247) 247th larva; 248) 248th larva; 249) 249th larva; 250) 250th larva; 251) 251st larva; 252) 252nd larva; 253) 253rd larva; 254) 254th larva; 255) 255th larva; 256) 256th larva; 257) 257th larva; 258) 258th larva; 259) 259th larva; 260) 260th larva; 261) 261st larva; 262) 262nd larva; 263) 263rd larva; 264) 264th larva; 265) 265th larva; 266) 266th larva; 267) 267th larva; 268) 268th larva; 269) 269th larva; 270) 270th larva; 271) 271st larva; 272) 272nd larva; 273) 273rd larva; 274) 274th larva; 275) 275th larva; 276) 276th larva; 277) 277th larva; 278) 278th larva; 279) 279th larva; 280) 280th larva; 281) 281st larva; 282) 282nd larva; 283) 283rd larva; 284) 284th larva; 285) 285th larva; 286) 286th larva; 287) 287th larva; 288) 288th larva; 289) 289th larva; 290) 290th larva; 291) 291st larva; 292) 292nd larva; 293) 293rd larva; 294) 294th larva; 295) 295th larva; 296) 296th larva; 297) 297th larva; 298) 298th larva; 299) 299th larva; 300) 300th larva; 301) 301st larva; 302) 302nd larva; 303) 303rd larva; 304) 304th larva; 305) 305th larva; 306) 306th larva; 307) 307th larva; 308) 308th larva; 309) 309th larva; 310) 310th larva; 311) 311st larva; 312) 312nd larva; 313) 313rd larva; 314) 314th larva; 315) 315th larva; 316) 316th larva; 317) 317th larva; 318) 318th larva; 319) 319th larva; 320) 320th larva; 321) 321st larva; 322) 322nd larva; 323) 323rd larva; 324) 324th larva; 325) 325th larva; 326) 326th larva; 327) 327th larva; 328) 328th larva; 329) 329th larva; 330) 330



which is sometimes somewhat lateral; ovules 2 in each cell, one being always a little superimposed, attached to a small cup-shaped podosperm from the summit of the axis, so that when there is only a single cell, they appear as if suspended somewhat parietally from near the summit, anatropal, sometimes resupinate. Style simple, erect, sometimes incurved and excentric, rarely wanting. Stigma clavate, or obsoletely lobed. Fruit drupaceous, with a single 1-celled, very rarely 2-celled putamen. Seed single, suspended, resupinate; testa thin, membranaceous, with a dorsal raphe and a nearly basal chalaza; embryo in the axis of fleshy albumen, sometimes with small oval cotyledons, scarcely longer and broader than the superior terete radicle, often as long as the albumen, with large oval foliaceous cotyledons longer and broader than the short terete superior radicle.

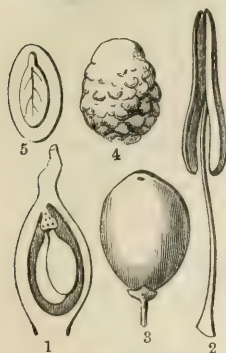


Fig. CCCVIII. bis.

“Until lately this groupe of plants was confounded with the Olacaceæ, with which, as will be seen from the above characters, they hold no relation. They differ most essentially in the calyx being always small, persistent and unchanged, never increasing with the growth of the fruit, the stamens being always alternate with the petals, not opposite; the petals and stamens are never fixed on the margin of the conspicuous cup-shaped disk; the ovary is normally plurilocular with axile placentation, and when unilocular, this happens only from the abortion of the other cells, the traces of which are always discernible, never completely unilocular at the summit, and plurilocular at base, with free central placentation. In Icacinaceæ the ovules are suspended below the summit of the cell in pairs superimposed by cup-shaped podosperms; only one of these becomes perfected, being often (if not always) retroverted, as in *Euonymus*, and the seed is furnished with the usual integuments, with a dorsal raphe, and nearly basal chalaza; in Olacaceæ the ovules are suspended from a free central placenta, and though only one becomes perfected, it is always deprived of any integumental covering, the remanet of the placenta and incomplete dissepiments appearing like a false raphe impressed into a groove of the albumen, as in *Santalaceæ*. In the Icacinaceæ the flowers are always articulated on their pedicels. They are evidently allied closely to Aquifoliaceæ, from which they differ in the æstivation of the corolla; from the Celastraceæ they differ in few respects, except in the æstivation of the corolla, and the pendulous ovules, and seeds.” (Monographs of the different genera that compose this family have recently been published by Mr. Miers, who intends giving drawings and analytical details of the structure of each. He proposes to form a distinct alliance, which he calls EUDRYALES, of several families chiefly distinguished by their dichlamydeous symmetrical flowers, consolidated carpels with axile placenta, consisting of the Celastraceæ, Aquifoliaceæ, Icacinaceæ, Hippocrateaceæ, Chailletiacæ, Cyrillaceæ, and perhaps others.)

“In the *Planta Javanica rariores*, the genus *Sarcostigma* has lately been placed by Brown among the Phytocreneæ, but with little evidence to prove such an affinity.

“This groupe consists of evergreen trees and shrubs, natives of tropical or nearly tropical countries, chiefly the East Indies, Africa, and South America, a single species being found each in New Holland, Norfolk Island, and New Zealand.

“No record has been made of the uses to which they are applied.”

#### GENERA.

##### I. ICACINEÆ.

*Icacina*, A. Juss.  
*Apodytes*, E. Mey.  
*Raphiostylis*, Planch.  
*Leretia*, Vell.  
*Mappia*, Jacq.  
*Nothapodytes*, Bl.  
*Desmostachys*, Planch.  
*Poraqueiba*, Aubl.

*Meisteria*, Scop.  
*Barteria*, Willd.

##### II. SARCOSTIGMEÆ.

*Pennantia*, Forst.  
*Stemonurus*, Bl.  
*Lasianthera*, Pal. Beauv.  
*Gomphandra*, Wall.

*Platea*, Bl.

*Phlobocalymna*, Griff.  
*Sarcostigma*, W. & A.  
*Discophora*, Miers.

##### III. EMMOTEÆ.

*Emmotum*, Desv.  
*Pogopetalum*, Benth.

NUMBERS. GEN. 13. Sp. 65.

Aquifoliaceæ.—ICACINACEÆ.—Celastraceæ.

J. MIERS.

Fig. CCCVIII. bis.—1. section of ovary of *Apodytes dimidiata*; 2. stamen of ditto, seen in front; 3. fruit of *Mappia tomentosa*; 4. its putamen; 5. perpendicular section of its seed—from drawings by Mr. Miers.



## ORDER CLXIII. CYRILLACEÆ.—CYRILLADS.

*Cyrtolobos*, Torrrey and Gray, *Fl. Bor. Am.* 1. 266. 1858. *Endl. Bot. Zeit.* p. 78.

**DIAGNOSIS.**—*Berberid* *Ecogenus*, with regular symmetrical flowers, ovules placentate, stamens alternate with the petals if equal to them in number, perianthium entire, and an imbricated corolla.

Shrubs, with evergreen simple leaves without stipules. Flowers usually in racemes. Calyx 4-5-parted. Petals 5, distinct, hypogynous, with an imbricated aestivation. Stamens 5 or 10, hypogynous. Anthers bursting lengthwise. Ovary 2-3-4-celled, always composed of some number of carpels different from that of the calyx, corolla and stamens; ovules solitary, pendulous; style short; stigma with as many lobes as there are cells of the ovary. Fruit a succulent capsule, or a drupe. Seeds inverted. Embryo in the axis of a very large quantity of albumen, with a very long superior radicle.

There can be no doubt that these plants are nearly related to Olacads, from which they are principally known by their imbricate, not valvate petals, destitute of all traces of hairiness. That being so, the connection between Olacads and Heathworts is established; for *Lædum* and *Clethra* in the latter come very near *Cyrtolobos*; these are, however, forced into a different Alliance by the want of any definite proportion between the whole of the parts of the flower. Endlicher suggests an affinity between *Cyrtolobos* and *Hollyworts*. The genus *Pickeringia*, now regarded as a sub-genus of *Ardisia*, seems to connect this Order with *Ardisiads*.

They are all inhabitants of North America.

Nothing has been recorded of any uses to which they could be applied.

## GENERA.

*Cyrtolobos*, Torr.  
*Myrsineum*, W.  
*Cyrtolobos*, Sol.  
*Walteria*, Fraz.  
*Elliptica*, Muhl.

NUMBERS. GEN. 3. Sp. 5.

(*Myrsineum*.)

POSITION.—*Pittosporaceæ*.—CYRILLACEÆ.—*Olacaceæ*.

*Endlicher*.



FIG. CCCIX.

FIG. CCCIX. *Myrsineum laetevirens*. 1. A flower. 2. A stamen. 3. A pistil. 4. A fruit.

See Planchon in *London Journ. of Bot.* V. 252, where he adds a genus named *Ardisia*.







## ORDER CLXIV. HUMIRIACEÆ.—HUMIRIACEÆ.

Humiraceæ, *Adrien de Jussieu in Ann. d. St. Hist. France, Nouv. Méth. 2. 87. (1822).* Martens, *Nouv. Gen. 2. 147. (1826).* *Erst. Gen. XXXV. Melastom.* 2. 4.

**DIAGNOSIS.**—*Erical Exogens, with polypetalous flowers, perfect monadelphous stamens, and 2-celled anthers with a long membranous connective.*

Trees or shrubs with balsamic juice. Leaves alternate, simple, coriaceous, function-venued, without stipules. Flowers in terminal or axillary cymes, or corymbs. Calyx imbricated, in 5 divisions. Petals imbricated, regular, alternate with the lobes of the calyx. Stamens hypogynous, 4 times or many times as numerous as the petals, monadelphous; anthers 2-celled, with a fleshy connective extended beyond the 2 lobes. Ovary superior, usually surrounded by an annular or toothed disk, 5-celled, often furnished with a transverse partition, with from 1 to 2 suspended anatropal ovules in each cell; style simple; stigma 5-lobed. Fruit drupaceous, with 5 cells on the same plane, or with secondary cells near the apex, sometimes with fewer, on account of the abortion of a part. Seed with a membranous integument; embryo narrow, orthotropical, sometimes lying in fleshy albumen; radicle long, superior.



FIG. CCCX.

The affinities of Humiriads cannot be satisfactorily discussed until their seeds shall have been more exactly examined. As the evidence at present stands, there is nothing to show that all the genera now collected really belong to the same group. *Helleria*, for instance, is said to have no albumen. They differ from *Meliads* much in habit, and in many respects in fructification, especially in having the aestivation of the corolla quincuncial, not valvate, and the stamens sometimes indefinite; the anthers of Humiriads, as Von Martius observes, are very different from those of *Meliads* in the great dilatation of their connective; their albuminous seeds and slender embryo are also at variance with *Meliads*. In the latter respect, and in their balsamic wood, they agree better with *Storaxworts*, besides to the variable direction of the embryo. Besides these points of affinity, Von Martius compares Humiriads with *Chleniads*, on account of both Orders containing diffuse and indefinite monadelphous stamens, several stigmas, partially abortive cells, universal albuminous seeds, and a singular complicated vernation, by which two longitudinal lines are impressed upon each leaf. To me it formerly appeared that the resemblance to *Chenopods*; as is indicated by their inflorescence, the texture of their stamens, their disk, their winged petioles, and their balsamic juices. But this cannot be, if there seeds are really albuminous, as is stated. Assuming the latter to be correct, they will form a connecting link between the *Erical* and *Berberal Alliances*, because of their resemblance to *Oleaceæ*. If really connected with *Heathworts*, it must be through some such genus as *Clethra*.

All are natives of the tropical parts of America.

*Humirium floribundum*, when the trunk is wounded, yields a fragrant liquid yellow balsam, called Balsam of Umiri, resembling the properties of *Cyperus* and *Ulmus* of Persia. The juice of *Humirium balsamiferum* and *floribundum* has a reddish colour, and smells of *Storax*; an ointment prepared from it is used for pain in the joints, and externally as a remedy for blennorrhœa and attacks of gonorrhœa.

## (GENERA.)

*Humirium*, Mart.  
*Humirium*, Mart.  
*Humirium*, Juss.

*Humirium*, Salm.  
*Humirium*, Aubl.

*Humirium*, Salm.  
*Humirium*, Aubl.

*Humirium*, Mart.  
*Humirium*, Mart.

NUMBERS GEN. 5 Sp. 18.

## EXAMPLES.

POSITION. —Ericaceæ.—HUMIRIACEÆ.

[Tree.]

*Humirium*.

FIG. CCCX.—*Humirium crassifolium*. 1. The flower; 2. the fruit; 3. the seed.



Mr. Miers is of opinion that one of the characters which particularly distinguish this family, "proves its affinity with the *Styracæ*, and brings it within the scope of his alliance of the *Cionospermæ*, where the ovules are always suspended from the summit of a free central placenta. Although the five cells are here established throughout the entire length of the ovarium, still, for a short distance near the apex, there exists a communication between all the cells, through small chinks round the margins of the apical portions of the dissepiments, showing that they are incomplete, and fail in reaching the central placentary column, which is here free from them and from the style, a fact explanatory of the meaning of A. Jussieu: "*loculis ad apicem inter se perviis*." As in *Styracæ*, the ovules are suspended in two series, some being thus ascending, others pendulous; and hence, in their development, the seeds will be found to be sometimes erect, often inverted, but in all cases the radicle points to the hilum. In this family we perceive an ovarium perfectly free, supported on a distinct gynophorus, and surrounded at its base by a conspicuous cupuliform ring toothed on its margin, but perfectly free on both surfaces to the base; the ovarium is hairy on all parts except those enveloped by that cup, which nowhere adheres either to its glabrous portion, or to the gynophorus. Outside of this hypogynous cup is seen another cup-shaped ring, serving to support the stamens, which in *H. floribundum* is entire, smooth, and fleshy outside, and bears the many series of filaments upon its margin, as well as on the whole of its inner surface, forming thus a second annular ring, free both from the hypogynous cup and the petals. Here, therefore, we perceive the gynophorus, the ovarium, cupuliform disk, staminiferous cup, petals, and sepals, each a distinct development, and each free to the base, but all springing from a fleshy torus, which is simply an expansion of the apex of the pedicel. The torus, therefore, as an organ well marked in many of the *Thalamifloræ*, must not be confounded with any of the distinct developments it serves to support."

Mr. Miers also proposes the following new Natural Order.

#### "APTANDRACEÆ.

*Aptandraccæ*, Miers, *Ann. Nat. Hist. 2nd Ser.* 7. p. 200. (1851); *Contrib. Bot.* 1. p. 1.

"Trees with alternate, petiolated, entire leaves, without stipules, and slender axillary branching panicles of minute pedicelled flowers, sub-umbellately aggregated.



Fig. CCCX. bis.

very small, patelliform, 4-toothed, persistent, and increasing with the growth of the fruit. Petals 4, equal, linear, free, revolute, inflexed at apex, and valvate in æstivation: 4 small petaloid scales, alternate with them, and placed between them and the staminal tube. Stamens cohering into a fleshy tube, nearly as long as the petals, with 8 equal anther-lobes, externally adnate in a close ring around its thickened mouth, and opening extrorsely by a valve-like membrane hinged at the bottom and reflected: pollen singularly cruciform. Ovary quite free, compressed, and 2-grooved, supported on a stipitate gynophorus, 1-locular at the summit, 2-locular at base, with a single anatropal ovule in each incomplete cell, suspended from near the apex of a free central

Fig. CCCX. bis.—*Aptandra Spruceana*. 1. an expanded flower; 2. a petal; 3. tube of stamens, with 4 petaloid glands at the base; 4. pistil; 5. section of ovary—from drawings by Mr. Miers.



placenta. Style erect, slender. Stigma spatulate in the mouth of staminal tube, compressed, with 2 obsolete contracted lips. Fruit unknown.

"From these characters it is clear that the genus on which this small order has been founded does not belong to any other known family: it approaches nearest to the Olacaceæ, through Cathedra and Endusa, in its 2-celled monospermous ovary; but its other characters are at variance. The dehiscence of its anther-salls bears some resemblance to that of the Berberidaceæ or Lauraceæ, but is still more like that of the anomalous genus Diehldanthera, as is also its stipitate ovary: but in the latter instance the stamens are quite distinct, and, by their adhesion to the alternate calycine petals, serve to glue them into a gamophyllous tube, and its ovary is completely 5-locular, with ovules attached to the axis.

"Only a single species has yet been discovered, which was found by Mr. Spruce, at Obidos, on the River Amazon."

## GENUS

*Aptandra, Moore.*

NUMBERS. GEN. 1. Sp. 1.

*Hamamelidacea.*

POSITION.—Olacaceæ.—APIANDEACEÆ.—Humiriaceæ.—Cactaceæ.

*Olacaceæ.*

J. Moore.



## ORDER CLXV. EPACRIDACEÆ—EPACRIDS.

Epacridææ, *R. Brown Prodr.* 535. (1810); *Link Handb.* 1. 601. (1829), a § of Ericææ; *DC. Prod.* 7. 734; *Endl. Gen. clx.*

DIAGNOSIS.—*Erical Exogens*, with *monopetalous flowers*, *perfect free stamens*, *seeds with a firm skin*, and *1-celled anthers opening longitudinally*.

Shrubs or small trees, their hair, when present, being simple. Leaves alternate, very rarely opposite, entire or occasionally serrated, usually stalked; their bases sometimes dilated, cucullate, overlapping each other and half sheathing the stem, without a midrib, but with the veins simple and parallel, or radiating from the base. Flowers white or purple, seldom blue, either in spikes or terminal racemes, or solitary and axillary; the calyx or pedicels with 2 or several bracts, which are usually of the same texture as the calyx. Calyx 5-parted (very seldom 4-parted), often coloured, persistent. Corolla hypogynous, monopetalous, either deciduous or withering, sometimes capable of being separated into 5 pieces, its limb with 5 (rarely 4) equal divisions, sometimes, in consequence of the cohesion of the segments, bursting transversely; the æstivation valvate or imbricated. Stamens equal in number to the segments of the corolla, and alternate with them; very seldom fewer in number. Filaments arising from the corolla, or hypogynous. Anthers one-celled, with a single receptacle of pollen, which forms a complete partition sometimes having a border; undivided, opening longitudinally. Pollen either nearly round or formed of 3 connate grains. Ovary sessile, usually surrounded at the base with 5 distinct or connate scales; with several, rarely a single, cell; ovules solitary and pendulous, or 00; style 1; stigma simple, or occasionally toothed. Fruit drupaceous, baccate, or capsular. Seeds with albumen. Embryo taper, straight in the axis, more than half as long as the albumen; the cotyledons very short, the radicle superior in the drupaceous species, variable in the capsular.

This Order differs from Heathworts chiefly in the structure of the anther; but that organ being one of the principal features of Heathworts, any material deviation from it acquires an unusual degree of consequence. In the latter Order the anther consists of 2 cells, usually furnished with peculiar appendages; in Epacrids it is 1-celled, with no appendages whatever. In some other respects Epacrids are different from Heathworts: their stamens very commonly adhere to the sides of the corolla, a circumstance which is at variance with the *Erical* and all the neighbouring *Alliances*, and their leaves have veins with quite the structure of *Endogens*, so that although the two Orders have but slender verbal distinctions, they are in reality extremely dissimilar.

All natives of the Indian archipelago, or Australasia, or Polynesia, where they abound as Heathworts do at the Cape of Good Hope. It is remarkable that only 1 or 2 Heathworts are found in the countries occupied by Epacrids.

The species are chiefly remarkable for the great beauty of their flowers and the singular structure of their leaves, as above described. All the fruits of the berry-bearing section, especially those of *Lissanthe sapida*, are esculent; but the seeds are too large, and the pulpy covering too thin, to render them very available for food; *Astroloma humifusum*, the Tasmanian Cranberry, is found all over that colony. It has a fruit of a

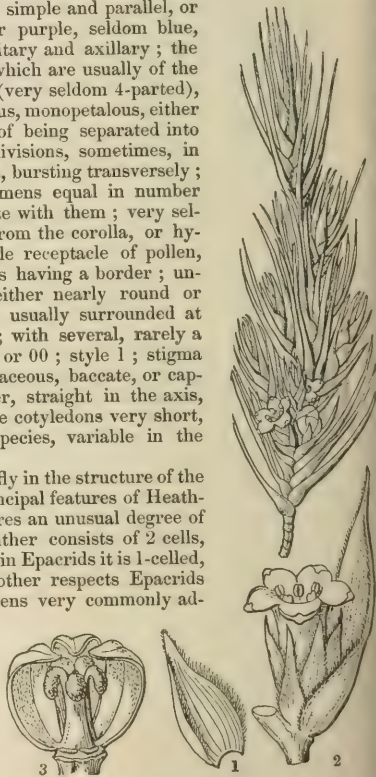


Fig CCCXI.

Fig. CCCXI.—*Dracophyllum scoparium*.—*Hooker*. 1. a sepal; 2. a flower with its bract; 3. section of a seed-vessel.



green or whitish colour, sometimes slightly red, about the size of a black currant, consisting of a viscid, apple-flavoured pulp inclosing a large seed. The tree grows singly on the trailing stems of the plant, which resembles Juniper, bearing beautiful scarlet blossoms in winter. The fruit of *Styphelia adserifolia*, a small prostrate shrub, resembling in appearance and character that of *Aspidosma frondosum*. *Leptopogon Hudsonianus* (Native Currant), is a large dense shrub, growing only on the low coast, and attaining to a height of from four to seven feet. The berries are small, white, and of a berry flavour. In D'Entrecasteaux's voyage in search of La Perouse, a French naturalist named Billaud was lost for three days on the south coast of New Holland, and supported himself principally upon the berries of this plant; in commemoration of which circumstance it has received its specific name.—*Leptopogon*.

GENERA.

I. <i>Styphelia</i> , L.—One-seeded.	<i>Mitiliparus</i> Forst.	<i>Styphelia</i> , R. Br.	<i>Aspidosma</i> , G. Don
<i>Ceratophyllum</i> , Berth.	<i>Ceratophyllum</i> , R. Br.	<i>Ceratophyllum</i> , R. Br.	<i>Aspidosma</i> , G. Don
<i>Myrica</i> , Smith.	<i>Aspidosma</i> , Hook. & G.	II. <i>Epacris</i> , L.—Many-seeded.	<i>Epacris</i> , R. Br.
<i>Saxifraga</i> , DC.	<i>Leptopogon</i> , R. Br.		<i>Saxifraga</i> , Berth.
<i>Aspidosma</i> , R. Br.	<i>Pyrola</i> , Gay	<i>Epacris</i> , Smith.	<i>Pyrola</i> , Guss.
<i>Leptopogon</i> , Cav. part.	<i>Pyrola</i> , Pers.	<i>Leptopogon</i> , G. Don.	<i>Epacris</i> , R. Br.
<i>Aspidosma</i> , DC.	<i>Monotropa</i> , L. Fr.	<i>Aspidosma</i> , G. Don.	<i>Leptopogon</i> , Guss.
<i>Styphelia</i> , R. Br.	<i>Aspidosma</i> , R. Br.	<i>Leptopogon</i> , G. Don.	<i>Epacris</i> , R. Br.
<i>Brachyglottis</i> , Sm. & N.	<i>Pyrola</i> , R. Br.	<i>Leptopogon</i> , G. Don.	<i>Epacris</i> , R. Br.
<i>Melicope</i> , R. Br.	<i>Pyrola</i> , R. Br.	<i>Leptopogon</i> , G. Don.	<i>Epacris</i> , R. Br.
<i>Leptopogon</i> , Cav. part.	<i>Pyrola</i> , R. Br.	<i>Leptopogon</i> , G. Don.	<i>Epacris</i> , R. Br.

NUMBERS. GEN. 30. Sp. 520.

POSITION.—ERICACEÆ.—EPACRIDACEÆ.

Additional list of names.



## ORDER CLXVI. PYROLACEÆ.—WINTERGREENS.

Pyroleæ, *Lindl. Coll. Bot. t. 5.* (1821).—Pyrolaceæ, *Ed. pr. clxiv.* (1836); *Endl. Gen. p. 760.* DC. *Prodr. 7.580.*

DIAGNOSIS.—*Erical Exogens, with half monopetalous flowers, the stamens free and all perfect, loose-skinned seeds, and an embryo at the base of the albumen.*

Herbaceous plants, rarely under-shrubs. Stems round, naked; in the frutescent species leafy. Leaves simple, entire or toothed. Flowers in terminal racemes, or solitary. Sepals 5, persistent, inferior. Corolla slightly monopetalous, hypogynous, regular, deciduous, 4- or 5-parted, with an imbricated æstivation. Stamens hypogynous, twice as numerous as the divisions of the corolla, those opposite the petals sometimes without anthers; anthers 2-celled, opening by pores. Ovary superior, 4- or 5-celled, many-seeded, with an hypogynous disk; style 1, declinate; stigma slightly indusiate. Fruit capsular, 4- or 5-celled, dehiscent, with central placentæ. Seeds indefinite, minute, with a loose winged skin; embryo minute, at the base of a fleshy albumen, placed across the principal axis of the exterior skin.

Wintergreens are usually considered a portion of the Order of Heathworts, but their habit is so different, that I cannot hesitate to separate them, especially as their minute embryo and declinate styles are real marks of difference. *Cladothamnus fruticosus* forms a passage to Heathworts, and *Pyrola aphylla* to Fir-rapes. An approach to the indusiate stigma of Goodeniads occurs in that of *P. aphylla* and some others.

Natives of Europe, North America, and the northern parts of Asia, in Fir woods, or similar situations.

*Chimaphila umbellata* is a most active diuretic; it is also found to possess valuable tonic properties. The leaves, which are bitter-sweet, applied to the skin, act as slight vesicatories. *C. maculata*, a very closely allied species, is asserted by some American practitioners to be wholly inert. It is said to be a palliative in strangury and nephritis, and to alleviate the ardor urinæ. It appears to possess a narcotic action. But this is contrary to the statement of Pursh, who says it has active properties; and therefore Wood and Bache are of opinion that it probably possesses the same qualities as *Chimaphila umbellata*. *Pyrola rotundifolia* had once a great reputation as a vulnerary.



Fig. CCCXII.

GENERA.

*Cladothamnus*, Bung.  
*Tolmiea*, Hook.  
*Chimaphila*, Pursh.  
*Chimaza*, R. Br.  
*Pseva*, Raf

*Shortia*, Torr et Gr.  
*Pyrola*, Tournef.  
*Moneses*, Salisb.  
*Bryophytanthum*, E.  
Mey.

*Galax*, Linn.  
*Erythrorhiza*, L. C.  
Rich.  
*Solenandria*, Palis.

*Blandfordia*, Andr.  
*Viticella*, Mich.  
*Belvedera*, Gronov.

NUMBERS. GEN. 5. Sp. 20.

*Gentianaceæ.*

POSITION.—*Monotropaceæ.*—PYROLACEÆ.—*Frankoaceæ.*

*Orobanchaceæ.*

Fig. CCCXII.—*Pyrola chlorantha*.—Hooker. 1. a pistil; 2. an anther; 3. seeds; 4. a seed much more magnified, with the nucleus cut through; 5. a section of the nucleus, showing the embryo.

(M. Planchon is of opinion that the undoubted affinity of Sarraceniads, p. 429, is here. See *London Journ. Bot.* v. 253.)



## ORDER CLXVII. FRANCOACEÆ.—FRANCOACEÆ.

Galathea, *Don in Pelt. Nov. 1840. Juss. Bot. 1848. Pl. Po. No. 14. 1850. — Francoaceæ, C. de Juss. Ann. Sci. Nat. 26. 9. 1850. L'Herb. de Bot. Belg. 36. 1843. 1844. Kuhn in bot. 42. 1850. DC. Prodr. 7. 777. Endl. Gen. p. 812.*

DIAGNOSIS.—*Erict. Eragrost.*, with *polypetalous flowers*, the *stamens five*, *half sterile and* *sterile-like*, and *trilocular seed*.

Stemless herbaceous plants, with lobed or pinnated leaves, without stipules. Stems scape-like, with a racemose inflorescence. Petals persistent for a long time. Calyx deeply four-cleft. Petals 4, inserted near the base of the calyx. Stamens sub-hypogynous, four times as numerous as the petals, alternately rudimentary. Ovary superior, with 4 cells opposite the petals; ovules numerous; stigma 4-lobed, sessile. Capsule membranous, 4-valved, with a loculicidal or septicidal dehiscence. Seeds numerous, minute, with a minute embryo in the base of fleshy albumen.

The importance of the character derived from the presence of a very minute embryo in the base of a large quantity of albumen not having been taken into account, Botanists do not seem to have judged correctly of the true position of Francoaceæ in a natural system. They stand near Saxifragaceæ according to Don, Rosaceæ in the opinion of De Candoille, Honeckeæ according to Adrien de Jussieu, Hooker, and Endlicher. It is true, that looking to the separation of the carpels of Francoa when ripe, and its abortive stamens, a case in favour of the approximation of the Order to Honeckeæ (Crassulaceæ) may seem to be made out; but then Tetilla does not separate its carpels, but divides them through the back; and moreover, there is no resemblance either in habit, or in the proportions of the flowers, or in the structure of the fruit, or in the organisation of the seeds between that Order and Francoaceæ. There can be no doubt that the real affinity of these plants is with Dionæa, which chiefly differs in its unilocular fruit, anisomerous flowers, and the want of sterile stamens. Its seeds are absolutely the same in all essential respects.

All the species hitherto discovered are Chilian.

The juice of the Francoas is said to be regarded in Chili as cooling and sedative; the root dyes black. Tetilla is called in the same country Teta de capra and Calantrillo; according to Pöppig, the leaf-stalks are eaten as a remedy for dysentery, and are remarkable for their astringency.



FIG. CCCCXIII.

GENERA.

Francoa, Cope.  
Lycopodium, Poir.

Tetilla, DC.  
Tetilla appendiculata, Hook.

Stamens, Murr.  
Francoaceæ, Kuhn.

NUMBERS. GEN. 2. Sp. 1.

POSITION.—Pyrolaceæ, FRANCOACEÆ.  
Pyrolaceæ.

FIG. CCCCXIII.—*Francoa appendiculata*. 1, stamens and pistil. 2, longitudinal section of the ovary and perpendicular section of the seed.



## ORDER CLXVIII. MONOTROPACEÆ.—FIR-RAPES.

Monotropææ, Nutt. Gen. 1. 272. (1818); Endl. Gen. p. 760.; DC. Prodr. 7. 779.

DIAGNOSIS.—*Erical Exogens*, with half monopetalous flowers, free stamens all perfect, loose-skinned or winged seeds, and an embryo at the apex of the albumen.

Parasites growing on the roots of Pines and other trees. The stems brown or almost colourless, with no true leaves, but covered with scales. Flowers in terminal spikes or racemes. Sepals 4, 5, membranous, tapering, distantly arranged in a broken whorl. Petals the same number, either imbricated and saccate at the base, or combined into a monopetalous corolla. Stamens 8-10, hypogynous, sometimes alternating with 10 hypogynous recurved glands; anthers 2-celled, sometimes opening longitudinally, the cells becoming confluent by the rolling back of the short anterior valves, and producing the appearance of a bilabiate anther; sometimes parallel-celled with bristles at the base. Ovary round, 4-5-furrowed, articulated, with a short cylindrical style, terminating in a succulent funnel-shaped stigma; 4-5-celled at the base, 1-celled, with 5 parietal placentæ at the apex. Fruit a dry capsule, splitting through the cells and bearing the placentæ on the middle of the valves. Seeds 00, with a loose skin, or winged at the end; embryo minute, undivided, inclosed within the apex of fleshy albumen.

The dehiscence of the anthers separates these from Wintergreens, as well as their leafless, scaly, and parasitical habit; besides which, there is a difference in the position of the embryo, that organ being at the apex of the albumen in Fir-rapes, and at its base in Wintergreens. The curious leafless *Pyrola* called *P. aphylla* exhibits, among Wintergreens, the peculiar scaly brown aspect of Fir-rapes, and thus connects the two Orders.

Natives of Europe, Asia, and North America, in cool places, especially in Fir woods.

Several species smell of Violets or Pinks. In Germany the powder of *Monotropa Hypopithys* is given to sheep when attacked by coughs. The North American Indians are said to employ *Pterospora andromedea* as an anthelmintic and diaphoretic.

## GENERA.

*Monotropa*, Nutt.  
*Hypopithys*, Dill.

*Orobanchoides*, Tournef. | *Schweinitzia*, Ell.  
*Pterospora*, Nutt. | *Monotropsis*, Schwein.

? *Corallophyllum*, Kunth.  
? *Pholisma*, Nuttall.

NUMBERS. GEN. 6. Sp. 10.

*Orobanchaceæ?*

POSITION.—*Pyrolaceæ*.—MONOTROPACEÆ.—

Fig. CCCXIV.—*Monotropa Hypopithys*. 2. a flower; 3. a pistil; 4. the same divided perpendicularly; 5. a seed. —*Nees* 6. seed of *Pterospora andromedea*; 7. a section of it.

(N.B. The parasitism of *Hypopithys* is denied by Duchartre in an interesting memoir in the *Ann. Sc.*, 3 ser. VI. 30.)



Fig. CCCXIV.



## Owen, CLIX. EFFECT OF HYPNOSIS

[illegible]

**Diagnosis.**—*Fecal Discharge*, with *emaciation*, *fever*, and *anorexia* all points to *diarrhoea* or *intestinal* *catarrh*, and *Verfärbung* *indicates* *typhoid* *fever*.

shrubs or under shrubs. Leaves evergreen, rigid, entire, whorled, or opposite, without stipules. Inflorescence variable, the pedicels generally bracteate. Calyx 1-5

3-lobed, nearly equal, imbricate-persistent. Corolla hypogynous, immiscellaneous, 4- or 5-lobed, usually separable into 4 or 5 pieces, regular or irregular, when withering, with an unequal distribution. Stamens 4 or more, equal in number to the segments of the corolla, of two or many hypogynous, or scarcely inserted into the base of the corolla; anthers 2-celled, the cells hard and dry, separate either at the apex or base, where they are furnished with some kind of appendage, and dehiscing by a pore. Ovary surrounded at the base by a ring, or scarious sides; many-ovuled; many-seeded; style 1, straight, stigma 1, undivided or toothed or 2-lobed, with an inclusion of an indurated. Fruit capsular, many-celled, with central placenta; dehiscence various. Seeds



INDEX



### Abstract

ster, minute, taste strongly according to the kernel, embryo cylindrical, in the axis of fleshy stamen; radicle much longer than the mesophyll and next the hilum.

This Natural Order contains some of the most beautiful plants of which we have any knowledge. They were formerly separated into two Orders by Linnaeus, and distinguished from the *Rubiacinae* by the development of their capsule, a character not now esteemed of almost importance, and consequently abandoned. Heathworts differ from *Hamamelis* and Bellworts in their superior ovary, from *Euphorbia* in the 2-celled anthers, from *Wintergreens* and *Polemoniads* in the structure of their seeds and habit, and from all the Orders of which *Hamamelis* and *Hamamelis* were

[illegible]Fig. 100XVI — *Amecorypterus gracilior*. 1, a lateral view; 2, a ventral view of the same.



may be considered the representatives, in the stamens not growing upon the petals, and in the cells of the ovary agreeing in number with the lobes of the calyx and corolla. The genus *Saurauja* among Dilleniads, has very much the structure of a *Clethra*. In Horsfield's *Plantæ Javanicæ*, p. 36, mention is made of the peculiar nature of the stigma in these plants, which Mr. Bennett justly compares to the indusium of Goodeniads. I have endeavoured to show that this rim is nothing more than the points of carpellary leaves separated from the stigma, which is itself a prolongation of the placenta. See *Botanical Register*, 1840, t. 9, and some observations on Babingtonia in the same work.

Heathworts are most abundant at the Cape of Good Hope, where immense tracts are covered with them; they are common in Europe and North and South America, both within and without the tropics; less common in Northern Asia and India, and almost unknown in Australasia, where their place is supplied by Epacrids. Although found in tropical countries, as for example, Java, it is only in their highlands.

It is worthy of note that although Botanists do not now admit the two sections of this Order to be of the same value as was assigned to them by Jussieu, yet that there is a considerable difference in the nature of their secretions. Ericææ are to a large extent inert, there not being, in the whole of the vast genus *Erica*, a single instance of a medicinal species, for *Erica arborea*, once held to be an alexipharmic, seems to have been a merely superstitious medicine. *Calluna vulgaris*, the common Heather, is however astringent, and is employed both by fullers and dyers; its tough branches are the common material out of which brooms are made in this country, and the flowers are peculiarly grateful to bees. We do, however, find among the Ericææ species to which useful qualities cannot be denied. Some are astringents; as *Arctostaphylos Uva ursi*, believed to be a decided palliative in nephritic paroxysms; it is also employed in dysuria, catarrhus vesicæ, leucorrhœa and gonorrhœa. Its action is slow, and it therefore requires to be given for a considerable period; although the effects are uncertain they sometimes give astonishing relief.—*Pereira*. The fruit of *Gaultheria procumbens*, a little dwarf North American evergreen, contains an aromatic, sweet, highly pungent volatile oil, which is antispasmodic and diuretic. A tincture has been useful in diarrhœa. Coxe states that the infusion is serviceable in asthma. It is used in North America as tea; and brandy in which the fruit has been steeped is taken in small quantities in the same way as common bitters. The oil is known under the name of Oil of Wintergreen, and is used by druggists to flavour syrups, and also by perfumers.

The berries of the succulent-fruited kinds are usually grateful, and sometimes used as food. *G. procumbens* and *Shallon*, *Arctostaphylos alpina*, and *Brossæa coccinea*, are examples of this. In Van Diemens Land the *G. hispida*, or Waxcluster, bears snow-white berries, with a flavour by no means unpleasant; in taste it is said to resemble the Gooseberry, but it is somewhat bitter; but according to some, the *G. antipoda* is said to have more merit as a fruit. The *Arbutus Unedo* (κομπος of Dioscorides) bears a red fruit something like a Strawberry, whence the plant has been familiarly named the Strawberry-tree; its bark and leaves are astringent. A wine is made from the fruit in Corsica, but it is reported to be narcotic, if taken in quantity. *A. Andrachne* is stated to have similar qualities. In some instances this narcotic quality is so concentrated that the plants become poisonous. The shoots of *Andromeda ovalifolia* poison goats in Nipal. It is stated by Dr. Horsfield that a very volatile heating oil, with a peculiar odour, used by the Javanese in rheumatic affections, is obtained from another species of *Andromeda*. *A. polifolia*, a small shrub, found wild in the bogs of the North of Europe, is an acrid narcotic, and proves fatal to sheep. Similar properties have been observed in the United States in *A. mariana*, and others. It is however in the *Rhododendræ* that dangerous narcotic qualities are most prevalent. The leaves of *Ledum latifolium* and *palustre* infused in beer render it unusually heady, producing headache, nausea, and even delirium. They have nevertheless been used, it is said, with advantage in tertian agues, dysentery, and diarrhœa. The leaves of *Kalmia latifolia* are poisonous to many animals, and are reputed to be narcotic, but their action is feeble. Bigelow states that the flesh of pheasants which have fed upon the young shoots is poisonous to man, and some cases of severe illness are on record which have been ascribed to this cause alone. The flowers exude a sweet honey-like juice, which is said when swallowed to bring on intoxication of a phrenitic kind, which is not only formidable in its symptoms but very lengthened in its duration.—*Burnett*. *Rhododendron chrysanthum*, a Siberian bush, is one of the most active of narcotics. Pallas and Koelpin assert that a strong decoction of the leaves is of the greatest service in chronic, but dangerous in acute, rheumatism. Its value as a means of removing arthritic complaints has also been highly spoken of. Finally, Pallas mentions an inveterate case of nervous sciatica, which had brought the patient to a state of lameness and deplorable emaciation, which was completely cured by perseverance in the use of the leaves for two years. No sub-



sequent inconvenience was experienced, nor any sign of belated fruit, even although the dose was as much as 4 fluid ounces of the concentrated acetan distill. It has been said that the common evergreen shrub, *Rhododendron punctatum*, was the plant from whose flowers the bees of Portugal collected the honey that produced the venereal symptoms described as having attacked the Greek soldiers in the famous retreat of the 10,000. Xanthodon says that after eating it the men felt compelled in all directions, so that the camp hospital was a battle-field covered with corpses. The Russian traveller Pallas is of opinion that Azalea pontica was the real source of the venereal distill. He says that the effects of the Lixine honey are less those of Tarentine balsamum, and occur in a country where no *Rhododendrons* grow. The natives are well aware of the deleterious qualities of the plant, and it is related that goats which browse on the leaves, before the pastures are green, suffer in consequence, and moreover the cattle and sheep perish. *R. maximum* is said by some writers to be a more potent poison. The Swiss *R. ferrugineum* is another poisonous one; it is obtained from its buds, which in Pichinassa mountains are called *Chir-di-Mam-matta*, and is used in parts of the Andes. The flowers of *R. arboreum* are eaten by the hill people of India, and are formed into a jelly by European visitors. The terminal leaves of *R. campocaulatum* are used as food by the natives of India, as we are informed by De Cambolle, is in the United States (the brown shrub that adheres to the patches of Kalidias and *Rhododendrons*). The leaves of *Arctostaphylos Uva-ursi* are used by the N. American Indians for mixing with tobacco in the preparation of pipe-stem of the former. (Cope).

# GENERA.

I. ERICACEÆ.—Fruit berry-like, fleshy, rarely capsule or berry. Buds naked.

## \* ERICACEÆ.

Saxifrag. Saxif.

*Cassiope*, Klotzsch.

*Ledum*, caprus, Klotzsch.

*Scilla*, Yucca, Klotzsch.

*Andromeda*, Klotzsch.

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NUMBERS. GEN. 42. Sp. 400.

*Andromeda*, Klotzsch.



## ALLIANCE XXXV. RUTALES.—THE RUTAL ALLIANCE.

DIAGNOSIS.—*Hypogynous Exogens, with monodichlamydeous symmetrical flowers, axile placenta, an imbricated calyx and corolla, definite stamens, and an embryo with little or no albumen.*

The larger part of this Alliance might and even has been regarded as one Natural Order, and by all Botanists the members of it are placed in very close relationship, with the exception of Waterpeppers and Podostemads. The two latter are, however, so very like degraded forms of Rueworts, that I cannot but regard them as standing in the same relation to Rutals as Hippurids to the Myrtal Alliance. They are, however, in tracing affinities, to be looked upon as mere lateral offshoots from some of the higher Orders, and not as either terminating a line or completing a circle of affinities.

Strictly speaking, the Rutal Alliance touches the Erical by means of Rueworts themselves, among which *Correa* assumes the appearance of an *Andromeda*; in like manner it does not pass into the Geranial Alliance by way of Podostemads, but through Beancapers, which stand close to Oxalids, or even Cranesbills, of which they have the stipules.

Terebinths approach the genus *Juglans* in the Diclinous series, through such of their unisexual genera as *Pistacia*.

## NATURAL ORDERS OF RUTALS.

- |   |                       |
|---|-----------------------|
| <i>Fruit consolidated, succulent, indehiscent. Petals imbricated.</i>   | } 170. AURANTIACEÆ.   |
| <i>Stamens free, or nearly so. Leaves dotted . . . . .</i>  |                       |
| <i>Fruit consolidated, hard, dry, somewhat valvular. Petals valvate. Stamens free. Leaves generally dotted . . . . .</i>  | } 171. AMYRIDACEÆ.    |
| <i>Fruit consolidated, capsular. Stamens deeply monadelphous or free. Seeds numerous, winged . . . . .</i>  |                       |
| <i>Fruit consolidated, berried or capsular. Stamens deeply monadelphous. Seeds few, wingless. Leaves dotless . . . . .</i>  | } 173. MELIACEÆ.      |
| <i>Fruit apocarpous. Ovule single, suspended by a cord rising from the base of the carpel . . . . .</i>   |                       |
| <i>Fruit apocarpous. Ovules collateral, ascending, orthotropal, sessile . . . . .</i>   | } 175. CONNARACEÆ.    |
| <i>Fruit finally apocarpous, few-seeded, with the pericarp separating in two layers. Ovules sessile, pendulous. Flowers ♂.</i>  |                       |
| <i>Fruit finally apocarpous, few-seeded, with the pericarp separating in two layers. Ovules sessile, pendulous. Flowers ♂-♀-♀.</i>  | } 177. XANTHOXYLACEÆ. |
| <i>Fruit finally apocarpous, one-seeded, with the pericarp not laminating, and a succulent conical torus . . . . .</i>  |                       |
| <i>Fruit finally apocarpous, one-seeded, with the pericarp not laminating, and a dry inconspicuous torus. Albumen wanting. Leaves alternate, without stipules . . . . .</i> | } 179. SIMARUBACEÆ.   |
| <i>Fruit finally apocarpous, few-seeded, with the pericarp not laminating, and a dry inconspicuous torus. Albumen present. Leaves opposite, with stipules . . . . .</i>     |                       |
| <i>Fruit finally apocarpous, many-seeded. Flowers polypetalous . . . . .</i>  | } 181. ELATINACEÆ.    |
| <i>Fruit finally apocarpous, many-seeded. Flowers apetalous, very imperfect . . . . .</i>   |                       |
|   | } 182. PODOSTEMACEÆ.  |
|   |                       |



ORD. CLXX. AURANTIACEÆ.—CARTAGH.

*Aurantaceæ* Cuv. Ann. Mus. N. Pl. (1804). *Myrt.* from Philon. (1793). *Urtic.* (1804). *Forst.* (1804). *Endl.* (1804). *Wendl.* (1804). *Urtic.* (1804).

DIAGNOSIS.—*Rubi* *Empet.*, with consolidated marginal indurated fruit, subnerved petals, free or nearly free stamens, and short hairs.

Trees or shrubs, almost always smooth, and filled everywhere with little transparent receptacles of volatile oil. Leaves alternate, often compound, always articulated with the petiole, which is frequently winged. Spines, if present, axillary. Calyx urceolate or campanulate, somewhat adhering to the disk, short, 5 or 6-toothed, withering. Petals 3 to 5, broad at the base, sometimes distinct, sometimes slightly combined, inserted upon the outside of an hypogynous disk, slightly indurated at the edges. Stamens equal in number to the petals, or twice as many, or some multiple of their number, inserted upon the same hypogynous disk; filaments flattened at the base, sometimes distinct, sometimes slightly combined in one or several parcels; anthers terminal, innate. Ovary free, many-celled; style 1, taper; stigma slightly divided, thickish; ovules solitary, twin, or 00, pendulous or occasionally horizontal, anatropal. Fruit pulpy, one or more-celled, sometimes with a leathery rind replete with receptacles of volatile oil, and even separable from the cells; cells often filled with pulp. Seeds attached to the axis, sometimes numerous, sometimes solitary, usually pendulous, occasionally containing more embryos than one; raphe and chalazæ usually very distinctly marked; albumen 0; endosperm straight; cotyledons thick, fleshy; radicle very short.

These are readily known by the abundance of oily receptacles which are dispersed over all parts of them, by their deciduous petals, compound leaves, often with a winged petiole, imbricated petals, and succulent or pulpy fruit. They are nearly related to Amyrids on the one hand, and to various genera of Rosæ on the other, but differ from the first in their pulpy fruit and imbricated petals, and from the latter in their consolidated juicy fruit. It is more difficult to distinguish them from Xanthoxyls, unless attention is paid to the fruit, the apocarpous structure of the ovary, and the polygamous flowers. *Lavanga* is remarkable for having the shrubby habit of Xanthoxyls, and the fruit of Citrus. The raphe and chalazæ are usually distinctly marked upon the testa, and sometimes beautifully. The genus *Citrus* is very subject to a monstrous separation of the carpels, which produces what are called horned Oranges, and fingered Oranges, the last of which is the genus *Sarcocaulis* of the younger Gærtner (t. clxxxv.), or to a multiplication of the normal number of carpels, in which case Orange is formed within Orange.

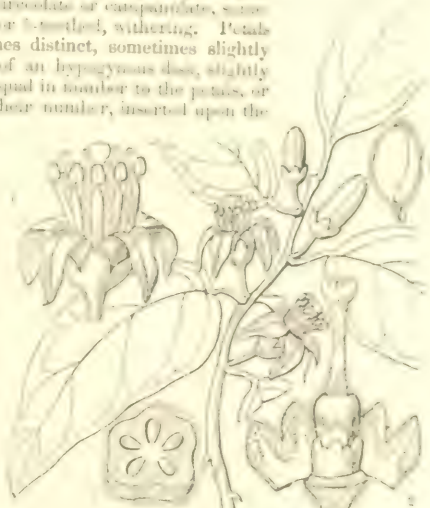


FIG. CCCVII.



FIG. CCXIX.



FIG. CCXXIII.

FIG. CCCVII.—*Microcitrus macrophylla* (Lam.) Willd. 1. A branch, 2. A flower, 3. The fruit, when the rind is rolled back, 4. A cross section of an ovary. 5. A longitudinal section of the fruit.

FIG. CCXIX.—A young Citrus, with a view of the receptacles of the fruit.

FIG. CCXXIII.—The fruit produced by this.



Citronworts are almost exclusively found in the East Indies, whence they have in some cases spread over the rest of the tropics. Two or three species are natives of Madagascar; one is described as found wild in the woods of Essequibo; and Prince Maximilian of Wied Neuwied speaks of a wild Orange of Brazil, called Laranja da terra, which has by no means the delicious refreshing qualities of the cultivated kind, but a mawkish sweet taste. This is called by Martius *Citrus Aurantium efferata*; but must have been introduced. *Limonia laureola* is remarkable as the only plant of this family found on the tops of cold and lofty mountains, where it is for some months of the year buried under the snow. The Hill people of India call it Kidar-patri and Kuthar-chara, and fancy that it is by feeding on its leaves that the Musk acquires its peculiar flavour.—*Royle*.

The wood is universally hard and compact; the leaves abound in a volatile, fragrant, bitter, exciting oil; the pulp of the fruit is always more or less acid. The Orange, Lemon, Lime, Shaddock, Pomelmoose, Forbidden Fruit, and Citron, Indian fruits, some of which have now become so common in other countries as to give a tropical character to a European dessert, are the most remarkable products of the Order. To this must be added the excellence of their wood, and the fragrance and beauty of their flowers. The fruits just mentioned are not, however, its only produce. The Wampee, a fruit highly esteemed in China and the Indian archipelago, is the produce of *Cookia punctata*. The berries of *Glycosmis citrifolia* are delicious; those of *Triphasia* are extremely agreeable. The productiveness of the common Orange is enormous. A single tree at St. Michael's has been known to produce 20,000 Oranges fit for packing, exclusively of the damaged fruit and the waste, which may be calculated at one-third more. The juice of the Lime and the Lemon contains a large quantity of citric acid. Oranges contain malic acid. A decoction of the root and bark of *Ægle Marmelos* is supposed, on the Malabar coast, to be a sovereign remedy in hypochondriasis, melancholia, and palpitation of the heart; the leaves in decoction are used in asthmatic complaints, and the fruit a little unripe is given in diarrhoea and dysentery. Roxburgh adds, that the Dutch in Ceylon prepare a perfume from the rind; the fruit is most delicious to the taste, exquisitely fragrant and nutritious, but laxative; the mucus of the seed is a good cement for some purposes. The leaves of *Bergera Königii* are considered by the Hindoos as stomachic and tonic; an infusion of them toasted stops vomiting; the green leaves are used raw in dysentery; the bark and root internally as stimuli. The young leaves of *Feronia elephantum* have, when bruised, a most delightful smell, much resembling Anise; the native practitioners of India consider them stomachic and carminative; its gum is very like Gum Arabic. Orange-leaves are sometimes prescribed to hysterical females instead of Tea. Oil of Neroli and Napha water, two delicious perfumes, are distilled from Orange-flowers; Cedrati, a variety of the Lime, is another perfume in much esteem. See further, *Royle's Illustrations*, p. 129.

#### GENERA.

<i>Atalantia</i> , <i>Corr.</i>	<i>Bergera</i> , <i>Kön.</i>	<i>Acronychia</i> , <i>Forst.</i>	<i>Ægle</i> , <i>Corr.</i>
<i>Triphasia</i> , <i>Lour.</i>	<i>Murraya</i> , <i>Kön.</i>	<i>Clausena</i> , <i>Burm.</i>	<i>Belou</i> , <i>Adans.</i>
<i>Limonia</i> , <i>Linn.</i>	<i>Chalcas</i> , <i>Lour.</i>	<i>Micromelum</i> , <i>Blum.</i>	<i>Citrus</i> , <i>Linn.</i>
<i>Winterlia</i> , <i>Dennst.</i>	<i>Marsana</i> , <i>Sonn.</i>	<i>Paramignya</i> , <i>Wight.</i>	<i>Sarcodactylis</i> , <i>Gærtn.</i>
<i>Glycosmis</i> , <i>Corr.</i>	<i>Cookia</i> , <i>Sonner.</i>	<i>Luvunga</i> , <i>Hamilt.</i>	<i>Papeda</i> , <i>Hussk.</i>
<i>Sclerostylis</i> , <i>Blum.</i>	<i>Quinaria</i> , <i>Lour.</i>	<i>Lavanga</i> , <i>Meisn.</i>	? <i>Chionotria</i> , <i>Jack.</i>
<i>Rissoa</i> , <i>Arn.</i>	? <i>Antacia</i> , <i>Lour.</i>	<i>Feronia</i> , <i>Corr.</i>	? <i>Severinia</i> , <i>Tenor.</i>

#### NUMBERS. GEN. 20. Sp. 95.

POSITION.—Amyridaceæ.—AURANTIACEÆ.—Xanthoxylaceæ.

#### ADDITIONAL GENERA.

*Casimiroa*, *Hoc. & Lec.*  
*Fagarastrum*, (*G. Don.*)  
*Myaris*, *Prest.* ) = *Clausena*.

According to Seeman, the fruit of *Casimiroa edulis* is delicious, but soporific.—*Voyage of Herald*, II. 170.




## ORDER CLXXI. AMYRIDACEÆ.—A. D. C.

[illegible]

DIAGNOSIS. — *Reactive T-lymphocytes*,  $45\%$ ; *small atypical lymphocytes*,  $15\%$ ; *small lymphocytes*,  $25\%$ ; *large lymphocytes*,  $10\%$ ; *monocytes*,  $5\%$ ; *neutrophils*,  $1\%$ ; *erythrocytes*,  $1\%$ ; *platelets*,  $1\%$ ; *reticulocytes*,  $1\%$ ; *basophils*,  $1\%$ ; *eosinophils*,  $1\%$ .

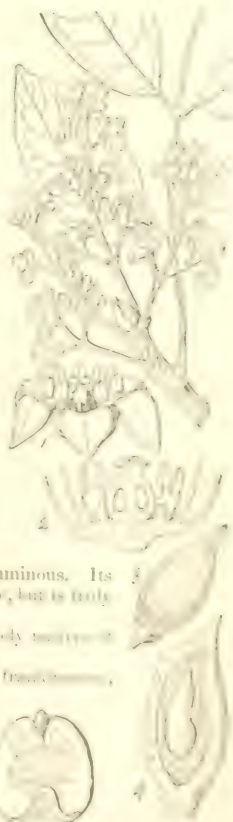
Trees or shrubs, abounding in balsam or resin. Leaves alternate or opposite, ovate or unequally pinnate, occasionally with stipules, and pellucid dots. Flowers axillary or terminal, in racemes or panicles, sometimes unisexual by abortion. Calyx persistent, somewhat regular, with from 2 to 5 divisions. Petals 3-5, inserted below a disk arising from the calyx; aestivation usually valvate, sometimes imbricated. Stamens twice as many as the petals, all fertile. Disk orbicular or annular. Ovary 1-5-celled, superior, sessile in or upon the disk; style solitary and compound; stigmas as many as the cells of the ovary, and where there is but one cell capitate; ovules in pairs, attached to the apex of the cell, anatropal, collateral. Fruit hard and dry, 1-5-celled, with its outer part often splitting into valves. Seeds without albumen; cotyledons either wrinkled and plaited, or amygdaloid; radicle superior, straight, turned towards the hilum.



These are plants with the appearance of Oranges, and in the instance of *Amyris* itself, with the dotted leaves of that Order; nor have they any positive mark of distinction, except their fruit forming a shell whose base eventually splits into valve-like segments. In general, however, the petals have a valvate æstivation; and *Amyris*, which wants that character, has only a one-celled ovary. The genera collected under this name are by no means perfectly known, and demand a scrupulous revision. *Copaifera* and *Myrospermum*, placed here in the last edition of this work, belong to the Leguminous Order. In referring the genus *Balanites* hither, I do so without having had the opportunity of examining its fruit, the seeds of which are said to be albuminous. Its calyx is certainly not valvate, as it has been described to be, but is truly imbricated.

What species have as yet been ascertained are exclusively natives of tropical India, Africa, and America.

It is here that we find the trees yielding myrrh and frankincense, besides which the species have all an abundance of fragrant resinous juice. The resin of *Boswellia* is used in India as frankincense, and also as pitch. It is hard and brittle, and, according to Roxburgh, is boiled with some low-priced oil to render it soft and fit for use. The native doctors prescribe it, mixed with ghee (clarified butter), in cases of gonorrhœa, and also in what they call Ritta Kaidapoo, which signifies flux accompanied with blood. The word is known, both in Arabic and Persian. *Boswellia serrata*, called Libanus thurifera by Celsus, grows in the mountains of Olibanum, a substance chiefly used as a grateful incense, but which also possesses stimulant, astringent, and diaphoretic properties. Arabian frankincense has also been said to be the produce of the same tree, but this is very uncertain. Myrrh, or Habbah,



1            4     \     \

THE END

Fig. CCCX. — *Mariqua obtusifolia*. — *D. Desfont.* 1, a shoot; 2, bud from 30-day-old seedling; 3, a fruit; 4, a section of the same.

Fig. CCCXXI—Embryo of *Elaphrium excelsum*—7-11.



is obtained on the Abyssinian coast from *Balsamodendron Myrrha*, a dwarf shrub called Kerobeta by the natives. Balm of Mecca, Beshan (perhaps the origin of the word Balsam), the Balessan of Bruce, is yielded by *B. Opobalsamum*.—Harris in *Chem. Gaz.* 1844. 148. *B. Gileadense* is also said to furnish it. A species of *Balsamodendron* is also mentioned by Mr. Griffith as being one of the most cultivated plants in Afghanistan for its aromatic and stimulant properties; it is called Schnee.—*Ann. Nat. Hist.* x. 194.

A kind of coarse resin is obtained from *Boswellia glabra*, and is used, boiled with oil, for pitching the bottom of ships. *Bursera paniculata*, called Bois de Colophane in the Isle of France, gives out, from the slightest wound in the bark, a copious flow of limpid oil of a pungent turpentine odour, which soon congeals to the consistence of butter, assuming the appearance of camphor. The gum of *Canarium commune* has the same properties as those of the Balsam of Copaiva; the three-cornered nuts are eaten in Java both raw and dressed, and an oil is expressed from them, which is used at table when fresh, and for burning when stale. The raw nuts are, however, apt to bring on diarrhoea.

Among fragrant products of less moment may be named *Bdellium*, the resin, in Africa, of the Niouttont or *Balsamodendron africanum*, and in India of *B. Roxburghii*, supposed to be the same plant as *Commiphora madagascariensis*; *Tacamahac* from *Elaphrium tomentosum*; Incense-wood from *Icica guianensis*; American Elemi in part from *Icica Icicariba*; American Balm of Gilead from *Icica Carana*; Balsam of Acouchi from *Icica Aracouchini*; Chibou or Cachibou resin from *Bursera gummiifera*; Resin of Carana from *Bursera acuminata*; Beaume à cochon or Beaume à sucrier, a substitute for Copaiva, from *Hedwigia balsamifera*; Resin of Coumia from *Icica ambrosiaca*. Finally, it is said that *Amyris toxifera* is poisonous; that *Amyris Plumieri*, and another species called by Dr. Hamilton *A. hexandra*, yield a part of the Gum Elemi of commerce; and that the wood of *Amyris balsamifera*, a Jamaica tree, furnishes one of the sorts of *Lignum Rhodium*. *Pieramnia ciliata*, a Brazilian tree, has a bitter subacrid bark, which is administered successfully as a substitute for *Cascarilla*, according to Martius. The layers of the liber of a species of *Amyris* were found by Cailliaud to be used by the Nubian Mahometans as paper, on which they write their legends. *Icica altissima* furnishes the Curana, Samaria, Acuyari, Mara, or Cedarwood of Guiana, one variety of which is red, the other white, according to Sir R. Schomburgk. It is light, easily worked, and very aromatic. This distinguished traveller states that one of his canoes, 42 feet long and 5½ feet wide, had been made from a single tree of this species. The leaves of *Balanites ægyptiaca*, a tree cultivated in Egypt under the Negro name of Soum, and the Arabic Hilelgie or Haledsch, are slightly acid, and have the reputation of being anthelmintic. The unripe flesh of its drupes is acrid, extremely bitter, and violently purgative; but when ripe it is eaten without inconvenience. A fat oil, called Zachum, is pressed from its seeds. The fruits are said to be mixed in commerce with *Myrobalans*.

#### GENERA.

I. BURSERIDÆ. — Ovary with more cells than one.	<i>Elaphrium</i> , Jacq.	<i>Coproxyylon</i> , Tuss.	? <i>Loureira</i> , Meisn.
	<i>Icica</i> , Aubl.	? <i>Knorria</i> , Moq. et Sess.	? <i>Toluifera</i> , Lour.
<i>Boswellia</i> , Roxb.	<i>Bursera</i> , Jacq.	<i>Garuga</i> , Roxb.	? <i>Triceros</i> , Lour.
	<i>Trattinickia</i> , Willd.	<i>Kunthia</i> , Dennst.	? <i>Barbylus</i> , P. Br.
<i>Libanus</i> , Colebr.	? <i>Dacryodes</i> , Vahl.	<i>Hemprichia</i> , Ehrenb.	? <i>Pachylobus</i> , G. Don.
<i>Plocoslea</i> , Endl.	<i>Marignia</i> , Commers.	? <i>Balanites</i> , Del.	
<i>Protium</i> , Burm.	<i>Dammara</i> , Gært.	? <i>Pieramnia</i> , Swartz.	II. AMYRIDÆ. — Ovary one-celled.
<i>Balsamodendron</i> , Kunth.	<i>Canarium</i> , Linn.	? <i>Methyscophyllum</i> , Eckl.	<i>Amyris</i> , Linn.
<i>Heudelotia</i> , A. Rich.	<i>Colophonia</i> , Commers.	et Zeyh.	<i>Elemifera</i> , Plum.
<i>Niouttont</i> , Adans.	<i>Hedwigia</i> , Swartz.	? <i>Tapiria</i> , Juss.	<i>Lucinium</i> , Plukn.
<i>Balsamea</i> , Gled.	<i>Tetragastris</i> , Gärt.	? <i>Jouquetia</i> , Schreb.	
<i>Balessan</i> , Bruce.	<i>Schwägrichenia</i> , Reic.		
<i>Commiphora</i> , Jacq.			

NUMBERS. GEN. 22. Sp. 45.

POSITION.—Anacardiaceæ. AMYRIDACEÆ.—Aurantiaceæ.

#### ADDITIONAL GENERA.

*Santiria*, Blume, near *Marignia*.  
*Pimela*, Lour. near *Canarium*.  
*Ganophyllum*, Bl. near *Protium*.



The source of the Increase of Frankincense of Scripture has been the subject of recent and exact observations. Dr. Royle says:—“Formerly at least the principal sources where the Hebrew *Libani* and the Greek *Libani* were both the same, Increase of Frankincense, the modern Olibanum. I also showed that it was an article of distant countries, said to have been obtained from *India* (Africa, &c.), and stated that Dioscorides mentions two kinds of Olibanum, one as African, the other from India. Most authors mention the former as from the country of the Sabians, that is, from the coast of Arabia. The author of the ‘*Periplus of the Red Sea*’ describes it expressly as proceeding up the coast of Africa. But it is now well known that many African products are taken across to the opposite coast of Asia, whence they are distributed to other parts of the world. Olibanum is one of the articles so brought and conveyed from Aden, &c. to Bombay; another kind is exported from Calcutta. I will proceed to show that these are the products of two species of the same genus of Terebinthaceous plants.

“Indian Olibanum is now imported in chests both from Calcutta and Bombay in considerable quantities, but it does not follow that all is necessarily a produce of India, as it may have been first imported and then re-exported. General Belknap stated long ago that no *Thur* was produced in India, and that the whole of what was exported to Portugal was first imported into the *Indes* from Arabia. Arab authors describe Frankincense under the name *Kusdur*, but give none as a synonyme. Mr. Oshersky, in *Asiat. Res.* v. p. 377, however, ascertained that *Cusdur* is a Sanscrit word signifying a ‘fragrant resin’ which he supposed was the produce of a tree called *Sillab*, and which in the Hindustani language is sometimes called *Salai*. This tree is found in various parts of the mountains of India. Some of the resin of this tree, sent to this country by Mr. Oshersky, and found to be obtained from Mr. Turnbull, of Mirapore, was recognised by drug dealers in London as Olibanum. Dr. Oshersky has more recently stated that he had obtained the specimens of Olibanum from the *Shalab* district. This tree is the *Boswellia* floribunda of Colebrooke, called also *B. serrata* in many works. There is also another species very similar to it, *B. glabra*, one or other, or both species, are found in hilly situations on the Coromandel coast, throughout Central India, spreading towards Mirapore, and along the foot of the Himalayas up even to the neighbourhood of Haridwar, where we have ourselves taken specimens of fine and fragrant incense of the tree. Dr. Fisher states that one species extends up into Afghanistan. One or both species of *Boswellia*, no doubt, yield the true Indian Olibanum. It was inferred in *Hist. Hind. Res.* p. 177:—‘From the affinity to vegetation in several parts of Arabia, Persia, and India, it is not impossible but the genus *Boswellia* may extend into other countries, and afford that which is known as African Olibanum.’

This inference seems to have been proved a fortnight in a paper read by Dr. Royle, at the Pharmaceutical Society, 8th April, 1844:—‘On the true African Olibanum.’ “This is shown by several authorities to be produced in great quantities in Africa and to be imported from the Somali coast, and that of Arabia, and from thence reexported to the different parts of India, whence it finds its way as Olibanum, to Europe. There is some reason, however, to believe that the Olibanum, the produce of and largely exported from Africa, is not exactly the same substance as that called African and Arabian Olibanum, by Dioscorides and Theophrastus, of the Indian navy (Harris, Abyssinia), described the tree which produces Frankincense as growing at an elevation of 1000 feet, on the mountain hills of the Somali coast, in the vicinity of Cape Guardafui. Dr. Meisner, of Aden, describes the tree as attaining ‘a height of about 30 feet, firmly attached to the limestone rock by a thick mass of vegetable substance (most of the tree, which sends roots into the crevices of the rock to an immense depth).’ Bent & Meisner describes the bark as consisting of four layers, the two middle are layers of a fine texture, transparent like oiled paper, and employed by the Somalis to wrap their spears. By this bark, of which a specimen was received from Major Harris, Mr. Bennett of the British Museum, recognised it as very similar to that of a tree of which specimens were collected by Schimper in his Abyssinian journey, and which was named by Endlicher, *Posslea floribunda*, and attached by him as an intermediate genus to *Sapindaceae*.” Dr. R., on seeing the specimen, found it so like frankincense that he concluded it to belong to that genus, or to one closely allied to it, especially as he had seen the leaves of a plant in Lieut. Wallis’s Somali collection, which appeared to him to be those of a *Boswellia*. Subsequently to the reading of his paper, Dr. R. found that the *Posslea floribunda* of Endlicher was referred to *Boswellia* by H. B. K. and considered to be the same plant as the *Amra* of India, found by Gaillard in the *Pers. & Mus. Res.* 10, certainly with a quiver, but the description, the papery bark, and the Frankincense like resin, being nearly every one of



the similarity of this plant with that described by Kempthorne and Malcolmson, and which has been shown by them to yield the Olibanum of commerce."

Dr. Stocks has shown that Googul, or Guggur of the Belooches, and the Mokul of the Persians, is the Bdellium of the Greeks, and is produced in Scinde by the Balsamodendron Mukul of Hooker. The Afghans mix the resin with "bajree flour," and make it into cakes, which they give their horses when they have a cold. The resin is also burnt as an incense, and "mixed with the mortar and plaster used in the construction of houses of a somewhat superior description, when durability is an object."—*Hooker's Journ. Bot.*, I. 261. The same author mentions a Bayee Balsam, from Balsamodendron pubescens, tasteless, inodorous, and brittle, almost entirely soluble in water.

Boswellia papyrifera is said to be one of the most remarkable trees in Abyssinia, where it is called Makker or Maker. It yields a fragrant transparent lemon-coloured resin, used as incense; but is chiefly remarkable for the bark peeling off into thin white layers, which were actually employed by Quartin-Dillon and Schimper for packing their dried plants in and sending them to Europe.—*Flor. Abyss.*, I. 148. The same peculiarity in the bark has been observed by Dr. Stocks in his Balsamodendron pubescens; he says it separates in large rolls much resembling those of Betula Bhoojpootra.



## ORDER CLXXII. CEDRELAEEAE.—CEDRELAEEAE.

*Cedrelae*, Brown in *Flind.*, 461. (1814).—Melbaud, *q. Cedrelae*, *Bot. Trav.* 1, 461. (1814).  
*Cedrelaeae*, *J. de Jussieu*, *Muséum* (1809); *Bot. p. 1*, 461; *Flind. Trav.* 1, 461. (1814).

DIAGNOSIS.—*Rutal* *Euphorbia*, with *conduplicate* capsule or fruit, *long* *moniliform* or *free* *stamens*, and *moniliform* *winged* seeds.

Trees, with timber which is usually compact, scented, and beautifully veined. Leaves alternate, pinnated, without stipules. Flowers in terminal panicles. Calyx 4-lobed. Petals 4-5, longer. Stamens 5-10; the filaments either united into a tube (Swartzia), or distinct (Cedreleae), and inserted into an hypogynous disk. Style and stigmas simple. Cells of the ovary equal in number to the petals, or fewer (3), with the ovules ascending or pendulous, anatropal, 4, or often more, imbricated, in two rows. Fruit capsular, with the valves separable from the thick axis, with whose angles they alternate. Seeds flat, winged; albumen thin or none; embryo orthotropal, straight; cotyledons flattish or fleshy; radicle very short, next the hilum.

Nearly related to Melbauds, in whose affinities they participate, and chiefly distinguished by their winged and imbricate seeds. Flindersia, a genus established by Brown in the Appendix to Captain Flinders' Voyage, differs from Cedrelae both in the insertion of its seeds, which are erect, in the dehiscence of its capsules, and also in having moveable dissepiments: these last, however, Brown considers as segments of a common placenta, having a peculiar form. Flindersia, and Chloroxylon are distinct from the rest of the Order, in having the leaves dotted with pellucid glands, in which respect they serve to connect Cedrelae with Citronworts, and, notwithstanding

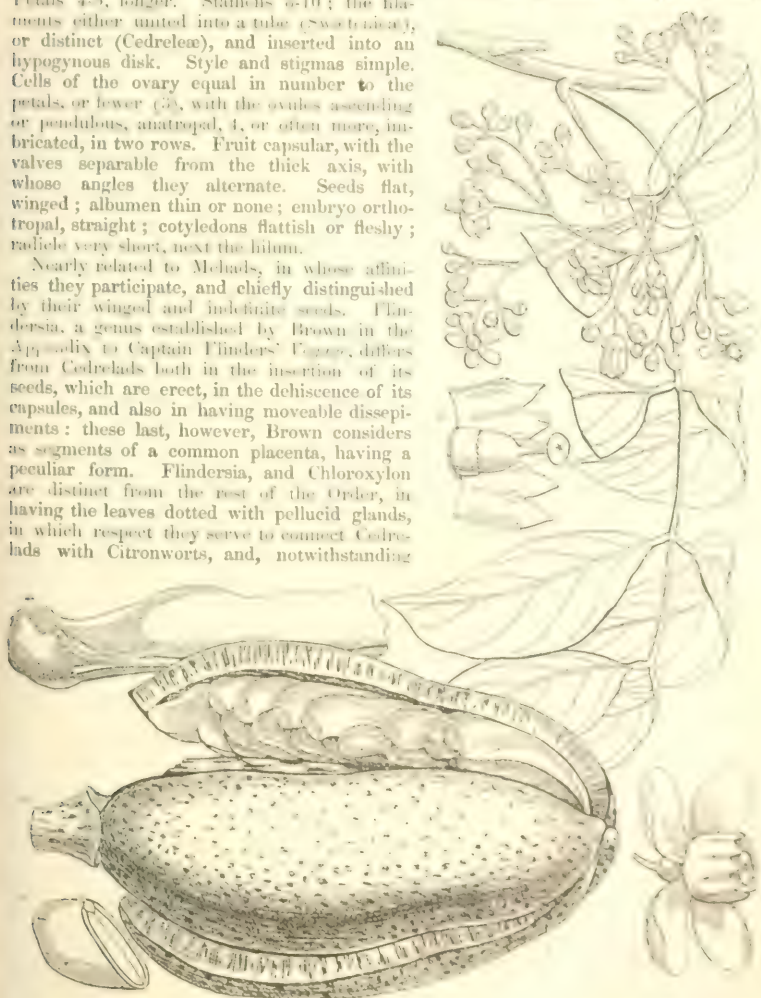


FIG. CCCXXII.

the absence of albumen, even with Rueworts. See the Appendix and Atlas to Flinders' Voyage.

FIG. CCCXXII.—*Swietenia* Malabarica.—1 a flower; 2 a pistil; 3 a fruit; 4 a seed; 5 a section of it to show the internal structure.



These are common to the tropics of America and India, but are very rare on the continent of Africa, and the adjoining islands.

The wood of the Order is in general fragrant and aromatic. The bark of *Cedrela* is fragrant and resinous; that of *C. Toona*, and of *Mahogany* (*Swietenia Mahagoni*) is also accounted febrifugal. The former is a powerful astringent, and though not bitter, a tolerably good substitute for Peruvian Bark in the cure of remitting and intermitting fevers; particularly when joined with a small portion of the powdered seed of *Cæsalpinia Bonducella* (*Kutulegee* of the Bengalese), which is a most powerful bitter. The bark was used in Java by Dr. Blume, with much success in the worst epidemic fevers, diarrhœa, and other complaints; Horsfield also applied it in various cases of dysentery, but in the last stage, when the inflammatory symptoms had disappeared. The bark of *Soymida febrifuga*, the *Rohuna* of Hindostan, called on the Coromandel coast the Red-wood tree, is a useful tonic in India in intermitting fevers; but Ainslie found that if given beyond the extent of 4 or 5 drachms in 24 hours, it deranged the nervous system, occasioning vertigo and subsequent stupor. It has also been employed successfully in India in bad cases of gangrene, and in Great Britain in typhus fever, and as an astringent. That of *Khaya*, the *Kassou-Khayé* of Senegal, is a common febrifuge in the swampy districts on the banks of the Gambia. *Cedrela febrifuga* bark is said by Blume to be employed successfully against the intermitting fevers of Java; he observes that it is tonic and useful in inflammation. The bark of *Chickrassia tabularis* has been found to be powerfully astringent without bitterness.—*Roxb.* *Juriballi* bark, a *Demerara* product, is also supposed to belong to some plant of this Order; it is described as being a potent bitter and astringent, far superior to Peruvian bark in fevers of a typhoid and malignant nature. It is cordial and purgative; and is also a powerful diaphoretic, especially if taken warm.—*Hancock.* An essential oil is found in *Flindersia* and *Chloroxylon*, as is indicated by their dotted leaves. The young shoots of *Cedrela angustifolia* have a powerful smell of Garlic, according to Ruiz and Pavon. *Satin-wood* is the produce of *Chloroxylon Swietenia*, which is one of the plants that yield the wood oil of India.—*Royle.* *Oxleya xanthoxyla*, a large tree, is the Yellow-wood of New South Wales. *Mahogany* is the timber of *Swietenia Mahagoni*.

#### GENERA.

I. SWIETENEÆ — Stamens monadelphous  
*Swietenia*, Linn  
*Mahagoni*, Adans.  
*Rota*, Scop.  
*Cedrus*, Mill

*Khaya*, Adr. Juss.  
*Soymida*, Adr. Juss.  
*Chickrassia*, Adr. Juss.  
*Chukrasia*, Adr. Juss.  
*Plagiotaxis*, Wall.

II. CEDRELEÆ. — Stamens distinct.  
*Chloroxylon*, DC.  
*Flindersia*, R. Br.  
*Oxleya*, A. Cunn.  
*Cedrela*, Linn.

*Jonsonia*, Adans.  
*Cedrus*, Mill part.  
*Toona*, Endl.  
*Cuiveracea*, Jones.  
*Surenus*, Rumph.  
*Vavæa*, Benth.

NUMBERS. GEN. 9. Sp. 25.

POSITION.—Meliaceæ.—CEDRELACEÆ.—Aurantiaçæ.



## ORDRE CLXXIII. MELIACEÆ. — MELIACINÆ.

*Mémoires de l'Académie des Sciences, Paris, 1789* — *Mémoires de l'Académie des Sciences, Paris, 1790* — *Ann. Chim. Phys.* 3, 103, 1800.  
*Atlas de l'Académie des Sciences, Paris, 1800* — *Bot. de l'Académie des Sciences, Paris, 1800* — *Bot. de l'Académie des Sciences, Paris, 1800*.

**Diagnosis.** — *Racem. Terminalis, with constituted leaflets or compound leaves, deeply more or less deltoideus, a few winged seeds, and (small) berries.*

Trees or shrubs. Leaves alternate, or occasionally somewhat opposite, simple, or pinnate, without stipules. Flowers sometimes imperfectly abortion, usually in mass.

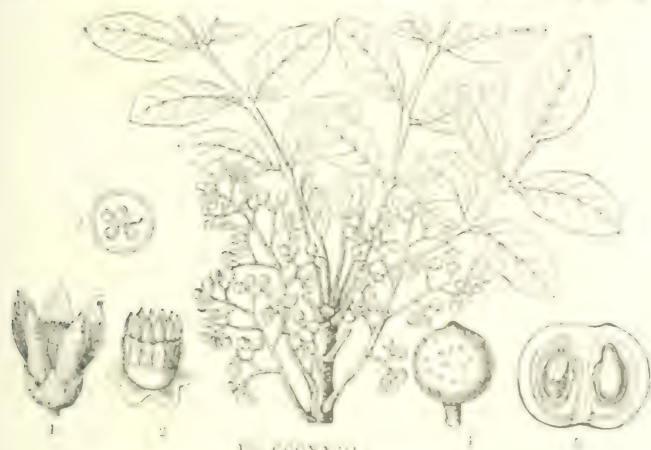


FIG. CCXXIII.

masses. Sepals 3, 4, or 5, more or less united. Petals the same number, hypogynous, conniving at the base, or even cohering, usually having a valvate or imbricated aestivation. Stamens twice as many as the petals; filaments cohering in a long tube; anthers sessile within the orifice of the tube. Disk frequently highly developed, surrounding the ovary like a cup. Ovary single, with the same number of cells as petals, or fewer, or the very seldom many more (10-12) cells; style 1; stigma distinct or combined, rarely anatropal, semi-anatropal, amphitropal or orthotropal; 1 or 2 in each cell, very rarely 3. Fruit berried, drupaceous or capsular, often, in consequence of abortion, 3-lobed, the valves, if present, having the dissepiments in their middle. Seeds not winged, with or without an aril; albumen fleshy (Mussa), or usually absent (Fraxinus). Embryo with leafy or amygdaloid cotyledons, within which the radicle is latent back.

This Order was ill understood until it was investigated by Adrien de Jussieu, from whose *Mémoire* I borrow the principal part of what follows. It is, in itself, related to Geraniaceae, although Cuscuta, which was considered a case of Monocotyledon, was removed from it. The inflorescence of Citronworts terminating in dichotomous with a central and prominent flower, the union that sometimes exists between the stamens of Citronworts, the number of stamens often double that of the petals, and the embryo with a short radicle drawn back between the cotyledons, are all points in which there is an accordance between the two Orders. The occasionally semidelphous stamens of Citronworts indicate an analogy with that Order, which is confirmed by the general tendency in both cases to produce two ovules in each cell of the ovary. The number and the relative position of the parts of the flower show an affinity with Sapotaceae, the structure of whose seeds is often absolutely the same as that of Meliaceae; their accordance in habit is incontestable, and in fact the species of the two Orders are often mixed together in herbaria. Calceolids are easily distinguished by their

FIG. CCXXIII.—*Elaeagnus, Strantheus*. 1. a flower. 2. a longitudinal section of the ovary. 3. a seed with a long wing. 4. a transverse section of the ovary. 5. a longitudinal section of the ovary.



winged seeds and the stamens being in a less degree monadelphous. As to a supposed affinity between Vineworts and this Order, it seems to be of a very distant description.

The species are found all over the world; in about equal quantities in America and Asia, and four times fewer in Africa; but these proportions are possibly due to the difference in the degree that those parts of the world have been examined. The Order does not extend further to the north than 40°; *Melia Azedarach* is naturalised as it were in Provence; and an *Hartighsea* exists in New Zealand. The extra-tropical species are, however, rare.

Bitter, astringent, and tonic qualities belong to the species of this Order, and are often developed in so considerable a degree as to render their application dangerous without precaution. A Brazilian plant called *Jito* is a powerful purgative, but *Piso* in mentioning it, warns us against the danger of employing it, and says that it is more often a poison than a medicine; it is supposed to be a species of *Guarea*, perhaps either *G. purgans* or *spiciflora*, which *Martius* informs us act violently on the uterus, and in an overdose produce abortion. *Trichilia cathartica* is reputed to have similar properties. The juice of the bark of *Guarea Aubletii* is a purgative and a violent emetic; the bark of *Guarea trichilioides* has similar qualities. The same power is assigned to the Arabian *Elcaija* (*Trichilia emetica*). *Jacquin* says that the negroes employ the root of *T. trifoliolata* to procure abortion. The root of *Melia Azedarach* is bitter and nauseous, and is used in North America as anthelmintic; the pulp that surrounds the seeds is said to be deleterious; but this is denied by *Turpin*, who asserts that dogs which he has seen eat it experienced no inconvenience; and children in Carolina swallow the seeds with impunity. It is supposed that the *Melia Azedarachta*, or *Neem-tree* of India, possesses febrifugal properties; a kind of *Toddy*, which the Hindoos consider a stomachic, is obtained from it by tapping; it is also called the *Margosa-tree*. From the fruit of the same plant an oil is obtained, which is fit for burning and for other domestic purposes, and, as *Ach. Richard* observes, is another instance, after the Olive, of the pericarp yielding that substance which is usually obtained from the seed. This oil is said to possess antispasmodic qualities. *Blume* attributes to the root of *Sandoricum indicum* properties similar to those of *Melia*; but the latter has a repulsive odour, while the other is aromatic; it is employed against leucorrhœa, combined with the bark of the root of *Carapa obovata*, which is bitter and astringent. The bark of *Carapa guianensis* has great reputation as a febrifuge; its oil is bitter and anthelmintic, and is said to be particularly useful in guarding iron against rust. *Carapa Touloucouna* or *guineensis* yields the *Tallicoona* or *Kundah* oil, an anthelmintic and purgative; it is acrid and bitter, and said to be well suited for lamps. *Trichilia Catigoa* (*Caá-tiguá*, *Braz.*) stains leather a bright yellow. *Rumphius* mentions the extreme bitterness of *Xylocarpus Granatum*. An alliaceous odour found in two species of *Cedrela* also occurs in a very prominent degree in some species of *Dysoxylon* and *Hartighsea*; the Javanese mountaineers use the fruit of these trees as Garlic. *Blume* suspects that some species of *Epicharis* have similar properties. A warm pleasant smelling oil is prepared from the fruit of *Trichilia speciosa*, which the Indian doctors consider a valuable external remedy in chronic rheumatism and paralytic affections. Some delicious fruits of the Indian Archipelago, called *Langsat*, or *Lanséh*, and *Ayer*, are species of the genus *Lansium*; they have a watery pulp, with a cooling pleasant taste. *Milnea edulis* is another plant of the Order, with eatable fruit. The ashes of *Carapa angustifolia* bark, mixed with fat clay, make an excellent kind of pottery.—*Aublet*.

#### GENERA.

I. MELIACEÆ. — Embryo with albumen.	II. TRICHILIEÆ. — Embryo exalbuminous.	Dysoxylon, Blum.	Heynea, Roxb.
<i>Quivisia</i> , Commers.	<i>Aglaia</i> , Lour.	<i>Schizochiton</i> , Spreng.	<i>Trichilia</i> , Linn.
<i>Gilibertia</i> , Gmel.	<i>Cumunum</i> , Rumph.	<i>Chisocheton</i> , Blum.	<i>Elcaja</i> , Forsk.
<i>Calodryum</i> , Desr.	<i>Cambania</i> , Commers.	<i>Syngium</i> , Adr. Juss.	<i>Portesia</i> , Cav.
<i>Naregamia</i> , Wight et Ar.	<i>Milnea</i> , Roxb.	<i>Schoutensia</i> , Endl.	<i>Torpesia</i> , Endl.
<i>Munronia</i> , Wight.	<i>Nyalelia</i> , Dennst.	<i>Hartighsea</i> , Adr. Juss.	<i>Moschoxylum</i> , Adr. Juss.
<i>Turraea</i> , Linn.	<i>Lansium</i> , Rumph.	<i>Macrorhizon</i> , Blum.	<i>Guarea</i> , Linn.
<i>Melia</i> , Linn.	<i>Sphaerosacme</i> , Wall.	<i>Epicharis</i> , Blum.	<i>? Elutheria</i> , P. Br.
<i>Azedarach</i> , Tournef.	<i>Nemeda</i> , Juss.	<i>Cabralea</i> , Adr. Juss.	<i>Carapa</i> , Aubl.
<i>Azadirachta</i> , Adr. Juss.	<i>Amoora</i> , Roxb.	<i>Didymochiton</i> , Blum.	<i>Xylocarpus</i> , Schreb.
<i>Mallee</i> , Adr. Juss.	<i>Amura</i> , Schult.	<i>Goniociton</i> , Blum.	<i>Persoonia</i> , Willd.
<i>Cipadessa</i> , Blum.	<i>Andersonia</i> , Roxb.	<i>Sandoricum</i> , Cav.	<i>Xylocarpus</i> , Adr. Juss.
<i>Heynichia</i> , Kth.	<i>Aphanamixis</i> , Blum.	<i>Ekebergia</i> , Sparm.	<i>? Odontandra</i> , H. B. K.
<i>Schizocalyx</i> , Hochst.		<i>Walsura</i> , Roxb.	<i>? Aitonia</i> , Linn. f.

NUMBERS. GEN. 33. Sp. 150.

POSITION.—Aurantiaceæ.—MELIACEÆ.—Cedrelaceæ.  
*Pittosporaceæ*.



## ORDER CLXXIV. ANACARDIACEÆ. — ALNACEÆ, OR TERNSTROMIACEÆ.

*Parlatore, Juss., Gen. Syst. Pl. in quatuor Classibus in Anacardiaceæ. Florent. in Card. 1842.*  
*Ench. Gard. Nat. p. 106. (1840.) Ternstroemia. Florent. in Card. 1842. in the 2. ed. (1844).*  
*1844. Juss. Pl. Ponds. 2. p. 8. (1844.) Juss. Pl. in Card. 1842. in the 2. ed. (1844).*  
*1844. Juss. Pl. Ponds. 2. p. 8. (1844.) Juss. Pl. in Card. 1842. in the 2. ed. (1844).*  
*1844. Juss. Pl. Ponds. 2. p. 8. (1844.) Juss. Pl. in Card. 1842. in the 2. ed. (1844).*

*Diagnosis.*—*Noted Element*, with a persistent fruit, and a slightly thick, green, by a green from the base of the fruit.

Trees or shrubs, with a resinous, green, smooth, or even milky juice. Leaves glabrous, simple, or ternate or unequally pinnate, without petiole hairs. Flowers terminal or axillary, with bracts, commonly  $\geq 2$  by abortion, sometimes abnormally so. Calyx



FIG. CCXXIV.

usually small and persistent, with 2, or occasionally 3-4, or 5 divisions. Petals equal in number to the segments of the calyx, perigynous, occasionally wanting, imbricated in aestivation. Stamens equal in number to the petals and alternate with them, or twice as many or even more, equal or alternately shorter, or partly sterile; segments distinct, or in the genera without a disk adhering at the base. Disk fleshy, annular or cup-shaped, hypogynous, occasionally wanting. Ovary single, very rarely 2 or 3, of which 4 or 5 are usually abortive, superior, (very rarely inferior), 1-celled; rays 1 or 2, occasionally 4, sometimes none; stigmas as many; ovule solitary, anatropous or half anatropous, attached to the bottom of the cell by a cord, which is either free or adherent to one angle of the cell, so that the ovules not uncommonly appear parietal. Fruit indehiscent, most commonly drupeous. Seed without albumen; radicle rather superior or inferior, but always directed towards the hilum, sometimes curved, seldomly bent; cotyledons thick and fleshy, or leaty.

The Order called Ternstroemiaceæ by Jussieu and some Botanists has been founded by Brown and Kunth, but preserved entire by De Cadeville, Arnott, and others. The new limited the Anacardiaceæ are distinctly known by their seeds hanging from the end of a thread which rises up from the base of the carpel, which is generally solitary, or on some rare distinct, and are sometimes, when ripe, placed at the end of an extremely elongated tube, as in the Cashew-nut itself. Melastomaceæ is remarkable for its numerous stamens, and especially for its hypogynous petals becoming enlarged, tumescence, and deep red to the fruit advances to maturity.

There is in tropical countries a genus called *Sp. stratiotes*, whose fruit is eaten under the name of Hog-plum, which genus it has been proposed to raise into an Order called

FIG. CCXXIV.—*Pistia stratiotes*. 1. A stamen. 2. A pistil. 3. A ripe fruit, split open to show the seed. 4. A ripe fruit, split open to show the seed. 5. A ripe fruit, split open to show the seed.



*Spondiaceæ*. It differs from *Anacards* in having a many-celled instead of a 1-celled, 1-seeded drupe; and on this more than anything else the character of the supposed Order was made to depend. But it appears that in the beginning *Spondias* has 5 distinct carpels, inclosed within a large fleshy cup, and that the growing together of these carpels is an after operation, unconnected with original structure; a *Mango*, in fact, if it had 5 carpels instead of 1, would be almost a *Spondias*. For this reason the supposed Order does not seem to be tenable. It is true that its ovules are described as being suspended from the apex of the cells; but this seems to arise from the cord contracting an adhesion with the side of the cells.

A writer in the *Linnaea* suggests that *Anacards* should be placed in the same class with *Malpighiads* (xiv. 243). A better approximation would have been to the Order of *Juglands*, with which they are not associated, chiefly because of their flowers not being amentaceous, nor usually absolutely ♂ ♀. *Pistacia*, indeed, is so, and some others; but the mass of the Order is polygamous, or has distinct rudiments of a ♀ in the ♂ flowers.

Chiefly natives of tropical America, Africa, and India; a few are found beyond the tropics, both to the north and south. *Pistacias* and some species of *Rhus* inhabit the south of Europe; many of the latter genus occupy stations in North America and Northern India, and also at the Cape of Good Hope; *Duvaua* and *Schinus* inhabit exclusively Chile and the adjacent districts. The Order is unknown in New Holland.

Large trees, with inconspicuous flowers, abounding in a resinous, sometimes acrid, highly poisonous juice, are the ordinary representatives of this Order, to which belong the Cashew-nut, (*Anacardium occidentale*), the Pistacia-nut (*Pistacia vera*), and the Mango fruit (*Mangifera indica*). Of these trees the Mango is the most important, its fruit being as highly valued in tropical as the Peach in temperate countries; its bark, especially that of the root, is a bitter aromatic, and is employed against diarrhoea, leucorrhœa, &c.; the young leaves are pectoral, the old leaves are used for cleaning the teeth, the seeds are anthelmintic; a resin that flows from the stem is reputed to be antisiphilitic. Some are celebrated for yielding a clammy juice, which afterwards turns black, and is used for varnishing in India; as the common Cashew-nut. The varnish of *Sylhet* is chiefly procured from *Semecarpus Anacardium*, the marking Nut-tree of commerce; and the varnish of Martaban from the Theet-see or Kheu, a plant called by Wallich *Melanorrhœa usitatissima*. All these varnishes are extremely dangerous to some constitutions; the skin, if rubbed with them, inflames and becomes covered with pimples that are difficult to heal; the fumes have been known to produce a painful swelling and inflammation of the skin, which, in a case recorded by Brewster, extended from the hands as far as the face and eyes, which became swelled to an alarming degree. I have known an instance of similar effects having been produced by roasting the nuts of *Anacardium occidentale*. But there are some constitutions which are not affected in any degree by such poisons. These varnishes are at first white, and afterwards become black. This has been ascertained by Brewster to arise from the recent varnish being an organised substance, consisting of an immense congeries of small parts, which disperse the sun's rays in all directions, like a thin film of unmelting tallow; while the varnish, which has been exposed to the air loses its organised structure, becomes homogeneous, and then transmits the sun's rays of a rich, deep, uniform red colour. Such a secretion is probably the substance mentioned by Ainslie as the Black Lac of the Burmah country, with which the natives lacquer various kinds of ware. The valuable black hard varnish called Japan Lacquer, is obtained from *Stagmaria verniciflua* in the Indian archipelago; this resin is extremely acrid, causing excoriations and blisters if applied to the skin; the people of Sumatra consider it dangerous even to sit or sleep beneath its shade; the manner of preparing its varnish is fully described in Jack's *Malayan Miscellanies*, p. 81. (Calcutta edition.) A black varnish well known in India is manufactured from the nuts of *Semecarpus Anacardium* and the berries of *Holigarna longifolia*. *Augia chinensis* produces a varnish in China and Siam. *Odina woderi*, *Buchanania latifolia*, and many more Indian species, have the same property. Several *Comocladias* stain the skin black. The leaves of some species of *Schinus* are so filled with a resinous fluid, that the least degree of unusual repletion of the tissue causes it to be discharged; thus some of them fill the air with fragrance after rain; and *S. Molle*, *Duvaua latifolia*, and some others expel their resin with such violence when immersed in water as to have the appearance of spontaneous motion, in consequence of the recoil. See *Bot. Reg.* 1580. *Schinus Arroceira* is said by Auguste de St. Hilaire to cause swellings in those who sleep under its shade. The fresh juicy bark of this shrub is used in Brazil for rubbing newly-made ropes, which it covers with a very durable bright dark-brown coating. The juice of the same plant is applied by the Indians in diseases of the eye. This last plant, and also *Rhus coriaria*, possess acid qualities. The fruit of *Cassuvium occidentale* and *Anacardium orientale* is said to exercise a singular effect upon the brain. Mastich, a resin useful for strengthening the gums and sweetening the breath, is the



produce of *Pistacia atlantica* and *Lentiscus*; Scio turpentine, a limpid, transparent resin, with an odour between Lemon and Fennel, is yielded by *Ficus Ventriculæ*; a substance like mastic is excreted by *Sclerola Mase*, and the Peruvians use it for strengthening their gums. A full account of the mode of obtaining gummiac at Cayenne from the *Pistacia Lentiscus*, is given in the *Annals of Chemistry*, vol. 3, p. 170. The juice of many species of *Rhus* is milky, sticky, black, and is sometimes, as in *R. glabra*, dendron and rubicundus, extremely poisonous, being virulent or is capable of poisoning persons who approach such plants in hot weather; and the same effect is produced by *R. venenata*. *R. coriaria*, a powerful astringent, is used by tanners; its seed is sometimes eaten by the Turks and used to sharpen their vinegar. The bark of *R. glutinosa* is considered a febrifuge, and is also employed as aulant for red colour. *R. glutinosa* Arbore a perruque of the French, and Venetian Sumach of the English, has good effect. Young Fustick, which is astringent as well as the fruit; it dyes a bright yell or orange. *R. vernix*, a Japanese tree, exudes a whitish resin or gummy, which soon becomes hard in the air. *R. succedanea* and *venenatissima* have a similar property. *R. integrifolia*, a Jamaica plant, yields a gum called Doctors' Gum, which has powerful purgative, emollient and diuretic effects. It is also said to be a vulnerary. (*Pharmacopœia*, vol. 1, 1809). However, not different plants mixed up under the name of Doctors' Gum and Hog Gum!

The fruit of several species of *Spondias*, especially *S. purpurea* and *Mombin*, is valuable in the Brazils and West Indies, where they are called Hog Plums. Martius says that the juice of the fruit of *S. tuberosa* is drunk in Brazil in fevers. The bark of *S. venenosa* is an aromatic astringent, employed in diarrhoea, haemorrhœa, &c. The most agreeable of these fruits is the *S. cytherea* or dulcis, a native of the Society Islands, whose golden drupes are compared for flavour and fragrance to the Pine apple. The negroes of Salsalgal make an intoxicating beverage from the fruit of *S. Birrea*.

#### GENERA.

<i>Pistacia</i> , Lam.	<i>Lentiscus</i> , Mart.	<i>Rhus</i> , Linn.	<i>Rhus</i> , Linn.
<i>Terebinthus</i> , Juss.	<i>Lithos</i> , Fenzl.	<i>Crotalus</i> , DC.	<i>Metopium</i> , P. Br.
<i>Leucodermis</i> , Tuckerm.	<i>Melastoma</i> , Nall.	<i>Santalum</i> , DC.	<i>Lythraea</i> , L.
<i>Dupuisia</i> , A. Rich.		<i>Lythraea</i> , L.	<i>Phytolacca</i> , Neck.
<i>Serjania</i> , Phoen.		<i>Phytolacca</i> , DC.	<i>Phytolacca</i> , Raf.
<i>Conocladia</i> , P. Br.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Detonantia</i> , Plum.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Cytocarpus</i> , H. B. K.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Odina</i> , Rehb.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Wickstr.</i> , Anders.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Hubertia</i> , Donat.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Isomira</i> , A. Rich.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Pezom.</i> , Guss.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Solanocarpus</i> , Weddell & A.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Solanus</i> , Linn.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Mollis</i> , Chus.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Mollis</i> , Fend.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Dryas</i> , Kunth.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Mauria</i> , Kunth.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.
<i>Pennantia</i> , Forst.		<i>Santalum</i> , DC.	<i>Lythraea</i> , Raf.

NUMBERS, GEN. 44, Sp. 75.

POSITION.—Xanthoxylaceæ.—ANACARDIACEÆ.—Meliaceæ.  
Celastraceæ.

#### ADDITIONAL GENERA

<i>Glycydium</i> , Dill.	<i>Santalum</i> , DC.
<i>Corynocarpus</i> , Fenzl.	<i>Santalum</i> , DC.
<i>Anisostemon</i> , Linn.	<i>Santalum</i> , DC.
<i>Sclerocarya</i> , Rehb.	<i>Santalum</i> , DC.

According to Dr. Hancock the Hog gum of Jamaica is really furnished by *Metopium*, and not by any *Guttifer*, see p. 407. A historical story that the stony fleshy kernel of *Spondias Burra* is eaten in Abyssinia. That the effects of this poison is not felt by some persons is confirmed by Dr. Prochaska in *Lehrbuch der Botanik*, Bot. vii. 159. But that its action is formidable upon others is shown by the following statement made by the same authority.—The Hon. Fr. Beckmann of Cassanovo, being once on a botanical excursion with some friends in the neighbourhood of that city, they came upon a specimen of the Poison Ash, *Rhus venenata*, and felt anxious of gathering specimens for examination. Thus they proceeded to do, though warned



of the consequence likely to accrue from handling it. The doctor stood aloof from a danger which he knew to be inevitable in his own person on near approach, or contact. The result was, some of the party suffered severely; the inflammatory action reaching up the arms to the trunk in one, in another only as high as the elbows; whilst in a third, the effects were confined to the hands, which, as is usual in these cases, became swollen, inflamed, and finally ulcerated. The rest mostly escaped the poison. On his return home, Dr. B. found a branch of the shrub in his vasculum, which had been put there by some sceptical joker amongst certain of the party, who affected disbelief in the poisonous properties of the plant. This he requested his daughter, who was not susceptible of the poison, to take out of the box and destroy, but at her suggestion permitted it to be dried for his herbarium. The next day symptoms of poisoning came on: intumescence of the entire body and lower extremities, attended with intolerable pain and irritation, confined him to bed for several days; nor was it till after many weeks that he was able to resume his duties. For several years after he was subject to a periodical recurrence of the erisypelatos inflammation, which marks this particular poison. See *Lond. Journ. Bot.*, vii. 160.

The Genus *Sabia*, referred doubtfully to this order by Wallich, has been elucidated by Blume and Miers, who agree in regarding it as related to Menispermads; to which its strictly hermaphrodite flowers are however much opposed. Not having myself had an opportunity of studying *Sabia*, I gladly make public Mr. Miers's views, in which all is said that can be urged in favour of the proposed approximation.

### "SABIACEÆ.

"Sabiaceæ, *Blume. Mus. Bot. Lugd. Bat.* 1, 368, fig. 44.—*Sabia, Coleb. Linn. Trans.* xii. 355, tab. 14.—*Wall. Fl. Ind.* ii. 308.—*Don. Dict.* ii. 69.—*Endl. Gen.* No. 5927.

"Climbing plants with alternate exstipulate leaves: flowers small, few, in short axillary panicles. Sepals 5, small, marked with coloured dots, persistent and unchanged. Petals 5, alternate, oblong, expanded, also marked with rows of red glandular dots, imbricate in æstivation, persistent, often increasing in size and enclosing the fruit. Stamens equal in number to, and opposite the petals, fixed with them at the base of a stipitate hypogynous disk or gynophore, alternate with its lobes: filaments shorter than the petals, strap-shaped, fleshy, suddenly contracted and sub-inflected at apex into a narrow linear dorsal connective: anthers introrse, round, sub-2-lobed, 2-celled, 2-valved, the valves uniting by their edges upon the septum, along which they burst and gape open, hence appearing as if only 1-celled. Disk conspicuous, stipitate, investing base of ovaries with its 5 erect lobes. Ovaries two, at first slightly adherent into a single obovate body, but soon distinct and separated, each 1-celled, with a single ovule attached by its middle to the ventral face; styles 2, erect, coherent at first into a single slender, erect, grooved, short column, and truncately terminated by 2 hollow points. Drupes 2, rounded, subreniform, and supported upon the gynophore with the persistent styles, which are now nearly basilar, in consequence of the very excentric growth of the ovaries upon their dorsal faces, each containing a single verrucose, reniform, roundish, and somewhat compressed nut, with its hollow hilum upon the ventral margin a little below its middle. Seed solitary, the shape of the nut, attached to the short inflected condyle, which proceeds from the hilum into the cell by a short podosperm on its ventral margin. Embryo exalbuminous, with large fleshy, flattened, somewhat gibbously ovoid cotyledons, which are sometimes contortuplicated or wrinkled; radicle inferior, suddenly inflected upon the ventral commissure, ascending and pointing towards the hilum.

"From the above details, founded upon an analysis of several species of *Sabia*, it is evident that it cannot be brought within the pale of any known family. Its nearest approach is to the Menispermaceæ, with which it agrees in its climbing habit, exstipulate leaves, the presence of coloured resinous ducts and dots in its wood and floral parts, distinct sepals and petals, stamens equal to and opposite the petals, distinct 1-locular carpels upon a stipitate gynophore, surrounded at its base by a lobed disk, single ovules attached by their middle to the ventral face of the cell, the rapid and excentric growth of the ovaries into a gibbous fruit, by which the persistent styles are left in an almost basilar position, drupes with a single 1-celled nut, and as in the tribe Pachygonceæ, containing a solitary exalbuminous seed, with large



fleshy cotyledons. It differs from that *salix*, however, in the petals being longer than the sepals in their subsequent growth, with the fruit, in the young form at first somewhat angulatus, and especially in its seeds with an oblong, rather long back upon the margin of the cotyledons. *Colletes* *lucida* has, I think, the cotyledons of *Sabia* in form, quadrifid, but by Blume they are said to be angulatus, but the figure shows them to be merely ovate, in the young form, and were flattened, without any curvature.

Dr. Wallich suggested the affinity of *Sabia* to the *Trientalidaceæ*, on account of its coloured perianth tube, but it offers a very dissimilar structure. By Endlicher it is placed as an intermediate genus of the *Ascoridaceæ*, but it differs from them, in having its stamens opposite the petals, in its distinct corolla and staminal tubes attached to the central axis. Three years ago I examined a flower of the original specimen of *Menispermaceæ* of Blume, and found it to be *Trientalis*, with *Sabia*, since which they have been separated by Blume himself. One of the other genera will be found to belong to this distinct group, from the short description given by Blume of *Eulalia*, it seems to approach near to *Sabia*.

GENERA.

<i>Sabia</i> Walb. <i>Menisperm.</i> III.		<i>Trientalis</i> W. <i>Menisperm.</i> II.	
NUMBERS. GEN. 2. SP. 9.			J. Miers.
<i>Menispermaceæ.</i> POSITION. ——— S44—54. ——— <i>Lardizabalaceæ.</i>			

(*Menispermaceæ*.—*SABACEÆ*.—*Lardizabalaceæ*.)—J. M.



## ORDER CLXXV. CONNARACEÆ.—CONNARADS.

*Terebintaceæ*, Juss. Gen. 368. (1789) in part.—*Connaraceæ*, R. Brown in Congo, 431. (1818); Kunth in Ann. Sc. Nat. 2. 359; Endl. Gen. cexlvii.; Meisner Gen. 78; Wight Illustr. 1. 162.

DIAGNOSIS.—*Rutal Exogens*, with apocarpous fruit, and collateral ascending orthotropal sessile ovules.

Trees or shrubs, sometimes climbing. Leaves compound, not dotted, alternate, without stipules. Flowers terminal and axillary, in racemes or panicles, with bracts, ♂, rarely ♂ ♀ by abortion. Calyx 5-parted, regular, persistent; æstivation either imbricate or valvular. Petals 5, inserted on the calyx, imbricated, rarely valvate in æstivation. Stamens twice the number of petals, hypogynous, those opposite the petals shorter than the others; filaments usually monadelphous. Carpels solitary, or several, each with a separate style and stigma; ovules 2, collateral, orthotropal, ascending; styles terminal; stigmas usually dilated. Fruit dehiscent, follicular, splitting lengthwise internally. Seeds erect, in pairs, or solitary, with or without albumen, often with an aril; radicle superior, at the extremity opposite the hilum; cotyledons thick in the species without albumen, foliaceous in those with albumen.

Brown says that the genus *Connarus* can only be distinguished from leguminous plants by the relation the parts of its embryo bear to the umbilicus of the seed; that is to say, by the radicle being at the extremity most remote from the hilum. This observation

must, however, be understood to refer only to some particular cases among leguminous plants, and also to the fructification; the want of stipules and regular flowers being usually sufficient to distinguish Connarads. From *Anacards* and others they are at once known by the total want of resinous juice, and their orthotropal ovules. Brown considers that *Cnestis* approaches *Averrhoa* in *Oxalids*, and this genus, according to Adrien de Jussieu, is allied to *Xanthoxyls* through *Brunellia*. *Cnestis* has a valvate calyx, and some albumen about its embryo. Dr. Wight, who has had opportunities of studying the Order, observes that the hypogynous insertion of the stamens and the 5-celled ovary, on a gynobase, of *Connarus* and *Cnestis*, indicate a very close approach to *Xanthoxyls*. [Bentham has pointed out the presence of stipules in several instances.]

The species are all tropical, and most common in America, according to Endlicher.

The aril of some species of *Omphalobium* is eatable, and their seeds oily. *Eurycoma longifolia*, the Punowur Pait of Malacca, is regarded by Oxley as a valuable febrifuge.—*Griffith*. The beautiful Zebra-wood of the cabinet-makers has been ascertained by Schomburgk to be produced by *Omphalobium Lambertii*, a large Guiana tree. Dr. Wight says that they are handsome flowering shrubs, conspicuous for their bright red capsules.

## GENERA.

*Connarus*, Linn.  
*Rourea*, Aubl.  
*Robergia*, Schreb.

*Malbrancia*, Neck.  
*Santaloides*, Linn.  
*Omphalobium*, Gärtn.

*Connarus*, Kunth.  
*Byrsocarpus*, Schum.  
*Tapomana*, Adans.

*Cnestis*, Juss.  
? *Thysanus*, Lour.

NUMBERS. GEN. 5. Sp. 41.

*Fabaceæ*.

POSITION.—*Anacardiaceæ*.—CONNARACEÆ.—

Fig. CCCXXV.—*Connarus pinatus*.—Wight. 1. a flower; 2. stamens and pistil; 3. ovary opened perpendicularly; 4. a cross section of it; 5. half a seed-vessel; 6. cross section of an embryo.



## ORDER CLXXVI. RUTACEAE.—Rutaceae.

[illegible]

**DIAGNOSTIC.** *Rattus* *Eximius*, with a head and feet which hardly become pigmy, and separates its posterior 2 toes, some pedicels, and a  $\frac{1}{2}$  inch.

Trees or shrubs, very rarely herbaceous plants. Leaves without stipules, opposite, alternate, simple or pinnate, covered with pellucid resinous dots. Flowers axillary, terminal  $\sigma$ , regular or irregular. Calyx in 4 or 5 divisions. Petals either as many as the divisions of the calyx, distinct, or combined into a monopetalous corolla, or occasionally wanting; aestivation for the most part twisted, very rarely somewhat valvular. Stamens equal in number to the petals, or twice or thrice as many, or even fewer in consequence of abortion, hypogynous, very rarely perigynous, placed on the outside of a disk or cup surrounding the ovary, and either free or combined with the base of the corolla, or in part abortive. Ovary sessile or stalked, its lobes equal to the number of petals, or fewer; ovules twin and collateral, or one above the other, rarely 4, seldom more; style single, occasionally divided towards the base into as many parts as there are lobes of the ovary; stigma simple or dilated; ovules usually 2, sometimes 4, partly ascending, partly suspended. Fruit consisting of several capsules, either cohering firmly or more or less distinct. Seeds twin or solitary, with a testaceous integument; embryo with a superior radicle, which is either straight or oblique, and cotyledons of variable form; albumen present or absent.

There are two principal divisions in this Order; the one Rutæe proper, which have seeds containing albumen, and a fruit, the sarcocarp of which is said not to separate from the endocarp; the other Diosmeæ, whose seeds have no albumen, and whose sarcocarp and endocarp divide into distinct bodies when the fruit is ripe. But Aug. de St. Hilaire (*Fl. Bras.* 1. 74) suspects that those two parts are equally separable in Rutæe, and that the specimens in herbaria which have been found otherwise were gathered before their fruit was quite ripe. Nevertheless I must preserve the distinction as a mark of two Orders, which supposing it to be valid, is maintained by the differences in deliscescence alone to constitute the distinction of Orders, the term Natural Order will no longer have an intelligible meaning. At all events, the difference is very slight, and the absence or presence of a small quantity of albumen can no longer be insisted upon now that so many cases of its absence or presence in the same Order are known; indeed, *Hortia*, a Diosmeous genus, has *Alchornea*, according to Aug. de



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Fig. CXXVI. — The stellar system, NGC 3390, in the constellation Ursa Major. 2. The galaxy is seen in an edge-on position, surrounded by a calyx. 3. The ring that, composed of numerous stars, is the component nucleus.



St. Hilaire. Rutææ are allied to Bean-capers through Peganum, which A. de Jussieu actually stations among the former, although its stipulate leaves, destitute of pellucid dots, seem to determine its greatest affinity to be with the latter. Rueworts differ from Citronworts in their capsular fruit invariably splitting into its component parts, from Xanthoxyls in the flowers being ♂, and from Anacards (Anacardiaceæ) in the ovules being sessile and suspended, not attached to the end of a long cord rising from the base of the ovary. The Cneorææ of Mr. Barker Webb seem to be a form of this Order of Rueworts rather than of Xanthoxyls; for their flowers are ♂ and their habit is not unlike that of Phebalium. The truly monopetalous corolla of Correa is very remarkable, and brings this Order so close to Heathworts that the indefinite seeds, porous anthers, but more especially the abundant albumen of the latter, form the principal marks of distinction.

M. Adrien de Jussieu thus describes the peculiarities of the pistil in that division of the Order which is called Diosmeæ:—"The ovaries, whether combined by their central axis, or distinct, always contain 2 ovules; if 4, or sometimes but 1, are found, that occurs only in genera stationed at the extreme limits of the group. They are collateral, or more frequently placed one above the other, and then one is usually ascending, and the other suspended. This position, which at first sight appears singular, is very natural; for the ovary is usually pierced by the vessels of the style only in the middle, and it is at that point that the two ovules are inserted, both at nearly the same height. If, therefore, they are placed one above the other, it is indispensable that one should ascend and the other descend. These ovules may be considered peritropal, rather than either ascending or suspended, or in other terms, attached by their middle rather than by either extremity."—"If the ovary of a Diosmea is divided across, its coat will be found to consist of two layers, the outer rather the most fleshy, and the inner thin or almost absent on the side next the axis, the side which is traversed from bottom to top by the vessels of the peduncle. These vessels at a certain height, meet those of the style, either at the point of its insertion or below it; united to these, they penetrate the cavity of the cell, the shell of which they pierce, and there form funiculi, to which the ovules are attached. Thus far the structure of Diosmea is little different from that of other Rutaceous plants. But this becomes modified as the ovary advances towards the state of fruit. The endocarp hardens by degrees, and at the same time separates from the sarcocarp. Its form resembles that of a bivalve shell, and may be more especially compared to that of a mussel; it presents two extremities, one superior, the other inferior, two lateral faces which are more or less convex, and two edges more or less acute, which unite them, the one external, the other internal. The two valves are woody and touch at the edges, except perhaps at a part of their inside where they are separated; this space is filled by a membrane which passes from one to the other: it is either slightly fleshy, or, which is more common, extremely thin, thickened in the middle by the passage of the vessels of the seed which penetrate it; and as, after having pierced it, they are almost immediately inserted into the seed, the latter appears to be actually borne by the membrane itself. When the fruit is perfectly ripe, the sarcocarp of each cell opens from above inwards, following a longitudinal furrow, which had become visible some time previously. Its inner surface is seen to be covered by projecting lignified vessels, which are directed obliquely from the inner edge towards the outer, and are indicated externally by some transverse projections. The endocarp is loose in the inside of the shell, unless at its membrane, by means of which it continues to preserve some degree of adhesion with the other parts; but it soon opens, the two valves separate in different directions, and force out the seeds. When this separation takes place, the membrane is torn all round, and either falls away or sticks to the seed. In the latter case it is found attached to the hilum, if one seed only has ripened; but then in removing it, the remains of the abortive ovule may be found on one side. If both seeds have arrived at maturity, they are usually seen one resting on the other by their contiguous flattened extremities, and the membrane extends along their inner edge, being enlarged at their point of contact, where two transverse prolongations are perceptible."

Rutææ are found in the south of Europe, whence they extend in our hemisphere as far as the limits of the Old World, following the southern part of the temperate zone, and very rarely advancing within the tropics. Dictamnus is found in the south of Europe. The Cape of Good Hope is covered with different species of Diosma and nearly allied genera; New Holland abounds in Boronias, Phebaliums, Correas, Eriostemons, and the like; great numbers of Cuspariææ and Pilocarpææ inhabit the equinoctial regions of America.

The species are characterised by their powerful odour and their bitterness; they act principally on the nerves. Common Rue, and another species, are said to be emmenagogue, anthelmintic, and sudorific. Ruta montana, a Spanish plant, is so acrid that it







## ORDER CLXXVII. XANTHOXYLACEÆ.—XANTHOXYLS.

Terebintaceæ, *Juss. Gen.* 368. (1789) *in part.*—Xanthoxyleæ, *Nees and Martins in Nov. Act. Bonn* 11. (1823); *Adrien de Jussieu Rutaceæ*, p. 114. (1825); *Endl. Gen. ccl.*; *Wight. Illustr.* 1. 168.—Pteleaceæ, *Kunth. Ann. des Sc.* 2. 345. (1824).—Terebintaceæ, *trib. 6. DC. Prodr.* 2. 82. (1825).

**DIAGNOSIS.**—*Rutal Exogens*, with a few-seeded fruit which finally becomes apocarpous and separates its pericarp into distinct layers, sessile pendulous ovules, and ♀-♂-flowers.

Trees or shrubs. Leaves without stipules, alternate or opposite, either simple, or more commonly abruptly or unequally pinnate, with pellucid dots. Flowers axillary or terminal, gray, green, or pink, ♀-♂-regular. Sepals imbricated, 3, or more commonly 4 or 5. Petals the same number, very rarely none, usually longer than the calyx; aestivation generally imbricated. Stamens equal to the petals in number, or twice as many, arising from around the base of the stalk of the abortive carpels; in the ♀ wanting or imperfect. Ovary made up of the same number of carpels as there are petals, or of a smaller number, either altogether combined, or more or less distinct; ovules in each cell 2, collateral, or one above the other, very seldom 4; styles more or less combined, according to the degree of cohesion of the carpels. Fruit either berried or membranous, sometimes of from 2 to 5 cells, sometimes consisting of several drupes or 2-valved capsules, of which the sarcocarp is fleshy and partly separable from the endocarp. Seeds solitary or twin, pendulous, usually smooth and shining, with a testaceous integument; embryo lying within fleshy albumen; radicle superior; cotyledons ovate, flat.

If we neglect the constant tendency which the Order of Xanthoxyls has to produce unisexual flowers, we shall have no good character to distinguish it from Rueworts. If the dry apocarpous, dehiscent character of the fruit is left out of consideration it will merge in Citronworts, among which *Luvunga* climbs like a *Xanthoxylum*. *Correa de Serra* has also pointed out a passage from one to the other through *Cookia*. "A mixture of bitter and aromatic principles, the presence of receptacles of oil that are scattered over every part, which give a pellucid dotted appearance to the leaves, and which cover the rind of the fruit with opaque spaces,—all these characters give the two families a considerable degree of analogy. This has already been indicated by *Jussieu* in speaking of *Toddalia*, and in his remarks upon the families of Citronworts and Anacards; and it is confirmed by the continual mixture, in all large herbaria, of unexamined plants of Anacards, Xanthoxyls, and Citronworts. The fruit of the latter is, however, extremely different; their seeds resembling, as they do, Anacards, are on that very account at variance with Xanthoxyls, but at the same time establish a further point of affinity between them and some Rutaceous plants which are destitute of albumen. Unisexual flowers, fruit separating into distinct cocci, seeds solitary or twin in those cocci, inclosing a usually

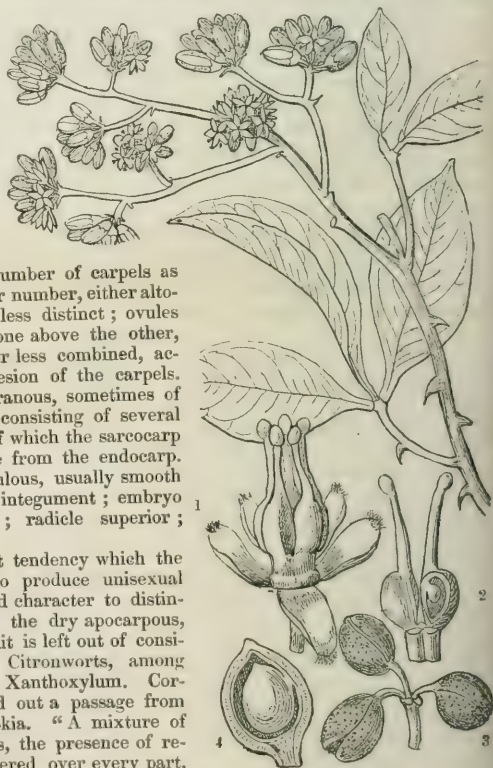


Fig. CCCXXVII.

Fig CCCXXVII.—*Toddalia floribunda*. 1. a flower; 2. a pair of carpels, one of which shows its ovule; 3. fruits; 4. a perpendicular section of one of them.



smooth and blackish integument, which is even sometimes hollowed out on an inclined edge; a fleshy substance surrounding the capsule of which is supposed to be an all point of analogy between Nanthoxyla and Sparganium, particularly between those which have in their flowers from 1 to 3 stamens inserted from the bottom of a pistil, and in the 2 flowers of the white suspended mostly solitary variety. Finally, several Nanthoxyls have in their habit, and especially in their foliage a striking resemblance to the Achi. The blackish flowers of Fraxinus, however, the presence of which are compressed, having a single style, 2 axils in the middle, and some on the outside, and which finally changes into a samara which is 1-celled and 1-seeded by abortion, all establish certain points of contact between Ptelea and Fraxinus.—*Id. ib. ib.*

Most of the species belong to America, especially to the tropical parts; some are found in temperate regions; they are seen in Africa; some exist in the Isles of France and Madagascar, and in New Holland; many are natives of India and China.

The species are nearly all aromatic and pungent. The Nanthoxylas are popularly called Peppers in the countries where they are found. *X. Clava* and *fraxinoides* are powerful sudorifics and diaphoretics; they are remarkable, according to Boissier, for their extraordinary power in exciting salivation, which applied externally to the gums or taken internally; both plants are reputed to have been used successfully in paralysis of the muscles of the mouth, in toothache, and in rheumatic affections. *X. caribæum* is held to be a febrifuge. The Chinese exonerate the root of *X. reticulata* among calefacient, sudorific, febrifugal, and emmenagogue medicines. The seeds of *X. Androngia* have the fragrance of Lemnaceæ. The purple capsules of *X. Rhiza* are gratefully aromatic, tasting like the peel of a fresh Orange. A paint called *Coccolila* in Brazil (*X. Lœmale*) is employed as a remedy for pain in the ear, for which purpose the powder of its bark is made use of. Its wood is very hard, and valuable for tool-making. The fruit of *Ptelea* has a strong, bitter, aromatic taste, and is said to have been used with some success as a substitute for Hops. Every part of the shrub has a strong pungent taste, more especially the roots when fresh. The leaves are eaten raw to pain in the bowels, and the pungent ripe berries make an admirable pickle.—*Wald.* The capsules and seeds of *X. hostile*, called *Tej-bul* by the natives, are employed in northern India for intoxicating fish; they are also given as the Taglanti of *Avicenna*, *X. piperitum* and *Avicennæ* are used in China and Japan as an antidote against all poisons; they would, undoubtedly, in many cases be of considerable use as a sudorific remedy. The bark of the root of *Toddalia aculeata* is said to be employed as a cure for the remittent fevers caught in the jungles of the Indian Isles.—*Rapin's Mémoires*, &c.

## GENERA.

<i>Ptelea</i> , Mill.	<i>Fraxinus</i> , Mill. & S.	<i>Sapindus</i> , Smith.	<i>Pyrausta</i> , L.
<i>Androngia</i> , Hook. & F.	<i>Clava</i> , Gray & M.	<i>Androngia</i> , Smith.	<i>Androngia</i> , Smith.
<i>Caribæa</i> , R. & P.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , R. & P.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , P. B.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , H.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.
<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.	<i>Caribæa</i> , L.
<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.	<i>Nanthoxyla</i> , L.
<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.	<i>Fraxinus</i> , L.
<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.	<i>Reticulata</i> , L.
<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.	<i>Hostile</i> , L.
<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.	<i>Clava</i> , L.
<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Androngia</i> , L.	<i>Andron</i>



## ORDER CLXXXVIII. OCHNACEÆ.—OCHNADS.

Ochnaceæ, DC. *Ann. Mus.* 17. 398. (1811); *Prodr.* 1. 735. (1824); *Endl. Gen.* ccxlviii.; *Meisner*, p. 66.

DIAGNOSIS.—*Rutal Exogens*, with a one-seeded finally apocarpous fruit, whose pericarp does not laminate, and a succulent conical torus.

Very smooth trees, or more generally under-shrubs, sometimes downy, having a watery juice. Leaves alternate, simple, entire, or toothed, with 2 stipules at the base, or one in the axil. Flowers usually in racemes, with an articulation in the middle of the pedicels. Sepals 5, persistent, imbricated in æstivation. Petals hypogynous, definite, sometimes twice as many as the sepals, deciduous, spreading, imbricated in æstivation. Stamens 5, opposite the sepals, or 10, or ∞, arising from a hypogynous disk; filaments persistent; anthers 2-celled, innate, opening by pores, or longitudinally. Carpels equal in number to the petals, lying upon an enlarged, tumid, fleshy disk, (the gynobase); their styles combined in one; ovule erect or pendulous, anatropal. Fruit composed of as many pieces as there were carpels, indehiscent, somewhat drupaceous, 1-seeded, articulated with the gynobase, which grows with their growth. Seeds without albumen or nearly so; embryo straight; radicle next the hilum; cotyledons thick.



Fig. CCCXXVIII.

Found in tropical India, Africa and America; a few are from the Cape of Good Hope.

These plants are for the most part bitter. *Walkera serrata* has a bitter root and leaves, and is employed in Malabar, in decoction in milk or water, as a tonic, stomachic, and anti-emetic. The bark of *Ochna hexasperma* is used in Brazil as a cure for the sores produced in cattle by the punctures of insects. It probably acts as an astringent. *Castela Nicolsoni* or Goatbush, is said to be as bitter as *Quassia* itself. The root and leaves of *Gomphia angustifolia* are bitter, and employed in Malabar, in decoction in milk or water, as a tonic, stomachic, and anti-emetic. *G. hexasperma* and *Jabotapita* are Brazilian remedies exhibited where bitters are demanded. The oil of *G. parviflora* is used in salads in Brazil.

Fig. CCCXXVIII.—*Ochna dubia*.—*Décadisme*. 1. expanded flower; 2. section of pistil and stamens; 3. pistil; 4. section of a ripe carpel.



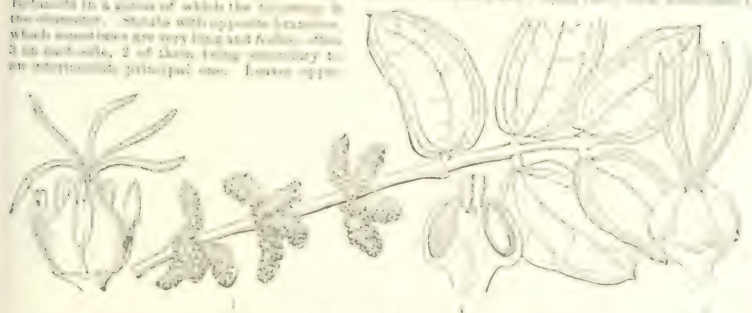
## APPENDIX

Hwang, Bo Graduate School Education, Yonsei University, Seoul 120-749, Korea	e-mail: Vbhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr	e-mail: ybhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr	e-mail: ybhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr e-mail: ybhwang@yongu.yonsei.ac.kr
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See, for his partial views respecting this order, Planchon, in *Ann. Jour.*, 2, F. 521 and 614, and VJ. 21.

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**INDEX**

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Fig. 60XXIX. 1. *Ctenaria halimifolia*; 2. flower of *Ctenaria myrtilloides* without the ovary; 3. an anther; 4. a perpendicular section of it.



## ORDER CLXXIX. SIMARUBACEÆ.—QUASSIADS.

Simarubaceæ, *Rich. Anal. du Fr.* 21. (1808); *Endl. Gen.* cclix.—Simarubæ, *DC. Diss. Ochn. Ann. Mus.* 17. 323. (1811); *Prodr.* 1. 733. (1824); *Adrien de Juss. Rutacées*, 129. (1825); *Meisner, Gen. p.* 65.

**DIAGNOSIS.**—*Rutal Exogens, with a few-seeded finally apocarpous fruit, whose pericarp does not laminate, a dry inconspicuous torus, exalbuminous seeds, and alternate leaves without stipules.*

Trees or shrubs. Leaves without stipules, alternate, occasionally simple, most usually compound, without dots. Peduncles axillary or terminal. Flowers whitish, green, or

purple. Flowers hermaphrodite, or occasionally by abortion unisexual. Calyx in 4 or 5 divisions, imbricated. Petals the same number, longer, either spreading or combined in a tube; æstivation imbricated. Stamens twice as many as the petals, each arising from the back of an hypogynous scale. Ovary 4- or 5-lobed, placed upon a stalk from the base of which the stamens arise, 4- or 5-celled, each cell with 1 suspended

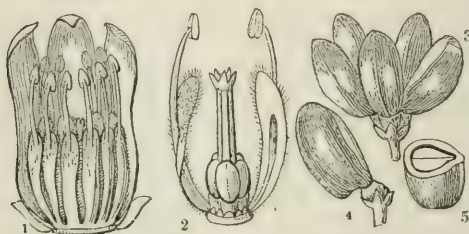


Fig. CCCXXX.

anatropal ovule; style simple; stigma 4- or 5-lobed. Fruit consisting of 4 or 5 drupes arranged around a common receptacle, indehiscent. Seeds pendulous, with a membranous integument; embryo without albumen; radicle superior, short, drawn back within the thick cotyledons.

Quassiads are akin to Beancapers in their stamens inserted upon hypogynous scales, and to Ochnads in their deeply-lobed ovary, or nearly separate ovaries; from these latter they are distinguished by their want of a succulent torus, and by their anthers bursting by longitudinal slits, not by terminal pores. A. de Jussieu says, "They are known from all Rutals by the co-existence of these characters; namely, ovaries with but one ovule, indehiscent drupes, exalbuminous seeds, a membranous integument of the embryo, and the radicle being retracted within thick cotyledons."

All are natives of tropical America, India, or Africa, with the exception of one Nipal plant.

The species are intensely bitter. A plant called Paraiba in Brazil, the *Simaruba versicolor* of St. Hilaire, possesses such excessive bitterness that no insects will attack it. Specimens of it placed among dried plants which were entirely devoured by the larvæ of a species of *Ptinus*, remained untouched. The Brazilians use an infusion in brandy as a specific against the bite of serpents, and also employ it with very great success to cure the lousy diseases to which people are subject in those countries. The wood of *Quassia amara* is intensely bitter. Lund and others assert that it does not yield the Quassia chips of the European druggists, but refer them to *Picraena excelsa*. But Guibourt says that the wood of both the root and stem of this *Quassia* is imported in the form of white scentless very light cylinders 1-2 inches in diameter; and that the *Picraena* wood is inferior in quality. I learn however from Mr. Lance, who resided for many years in Surinam, that although large quantities of *Quassia* were exported 20 or 30 years since, yet that for many years none has been collected for that purpose, and he did not hear of a single instance of its shipment during the 10 years he passed in Surinam. *Quassia* wood is in fact no longer used even in that colony as a medicine, being thought to have some bad properties along with its intense bitter. The flowers are however still infused in wine or water as a stomachic. The bitter has been used as a substitute for hops in the manufacture of beer; an infusion of the chips is employed to poison flies. *Simaruba amara* is more commonly employed. The bark of the root is stripped off and sent to Europe. In Cayenne the decoction, which is bitter, purgative, and even emetic, is used in fevers and diarrhœa. The wood has similar

Fig. CCCXXX.—*Simaruba guianensis*. 1. a flower with part cut away; 2. pistil and two stamens; 3. fruit; 4. a single carpel; 5. cross section of it and of the seed which it contains.



properties, but is less active. The *Jamaica* plant, which being distillable, only in another species, has an acedulous bitter bark which yields no properties by being infused and water. It has been remarked that the infusion is more bitter than the decoction. It acts as a tonic and is used in dyspepsia, diarrhoea, chronic dysentery, and all cases of impaired tone of the alimentary canal. *Nitum quassatorum* is used for similar purposes in the North of India. The timber of *Simaruba amara* is described by Mr. F. Seemann, being as resembling White Pine, both in colour and quality. Simple bark, an Indian febrifuge, is obtained from *Samadera indica*. *Brucea antyagasteria* and *Samaranea* possess properties similar to those of Quassia. A tree called *Cedron* (*Cedronia Cedron*), has lately attained great celebrity. The most recent record of it is in the "History of the Buccaneers," an old work published in London, in the year 1705. Its use, as an antidote for snakes and poisons of growth, was there formerly noted, but whether on the authority of the natives, or accidentally discovered by the pirates, does not appear. If the former was the case, they must have known it while on some of their cruises on the Magdalenas, for in the Isthmus the very existence of the tree was unsuspected until about 1845, when Don Juan de Auzedduin ascertained, by comparison, that the *Cedron* of Panama and London was identical with that of Carthagena. The virtues of its seeds, however, were known years ago, from those fruits imported from the Magdalena, where, according to Mr. William Purdie, the plant grows in profusion about the village of San Pablo. In the Isthmus it is generally found on the outskirts of forests in almost every part of the country, but in greater abundance in Puerco and Verapaz, than in Panama. The natives hold it in high esteem, and always carry a piece of the seed about with them. When a person is bitten, a little, mixed with water, is applied to the wound, and about two grains scraped into brandy, or, in the absence of it, into water, is administered internally. By following this treatment the bites of the most venomous snakes, scorpions, centipedes, and other noxious animals, have been unattended by dangerous consequences. Doses of it have also proved highly beneficial in cases of intermittent fever.—*Seemann*.

For many remarks upon this order see Planchon in *Leand. Journ. Bot.*, 17, 189, whose arrangement of the genera is as follows:

# GENERA

## I. SIMARUBACEÆ.

*Quassia*, L.  
*Simaruba*, Jacq.  
*Lawsonia*, Adans.  
*Picrostigma*, Vahl.  
*Nitum*, L.f.  
*Begonia*, Poir.  
*Manduca*, Guss.  
*Mesaspium*, Trimen.  
*Sargola*, L.f.  
*Azara*, A. DC.  
*Phoradendron*, Naud.  
*Hesperia*, L.f.  
*Samadera*, A. DC.  
*Cordia*, Turp.

## II. HARRISONDIA.

*Harrisdia*, H. B.  
*Begonia*, R. & S.  
*Lasiolaps*, Lamour.

## III. ALIATACEÆ.

*Alseodora*, Jacq.  
*Tournefortia*, Blume.  
*Picrostigma*, Blume.  
*Nitum*, H. B.  
*Lawsonia*, L.f.  
*Manduca*, Willd.  
*Lawsonia*, Fl. Ind.  
*Begonia*, M. B.  
*Simaruba*, Jacq.  
*Quassia*, L.f.  
*Phoradendron*, L.f.  
*Phoradendron*, L.f.

## IV. SPATHULACEÆ.

*Spathula*, Jacq.  
*Spathula*, L.f.  
*Lawsonia*, L.f.  
*Begonia*, L.f.  
*Lawsonia*, L.f.

# NUMBERS GEN. 17. Sp.

POSITION.—Zygophyllaceæ.—SIMARUBACEÆ.—Xanthoxylaceæ.  
*Palagutaceæ*.



## ORDER CLXXX. ZYGOPHYLLACEÆ.—BEANCAPERS.

Zygophyllæ, *R. Brown in Flinders*, (1814); *DC. Prodr.* 1. 703. (1824); *Adrien de Juss. Rutacées*, 67. (1825); *Endl. Gen. ccliii.*—*Meliantheæ*, *Endl. p.* 1165.

DIAGNOSIS.—*Rutal Exogens*, with few-seeded finally apocarpous fruit, whose pericarp does not laminate, a dry inconspicuous torus, albuminous seeds, and opposite leaves with stipules.

Herbaceous plants, shrubs, or trees, with a very hard wood, the branches often articulated at the joints. Leaves opposite, with stipules, very seldom simple, usually unequally pinnate, not dotted. Flowers solitary, or in pairs or threes, white, blue, or red, often yellow, hermaphrodite, regular. Calyx divided into 4 or 5 pieces, with convolute aestivation. Petals unguiculate, alternate with the segments of the calyx and a little longer, in aestivation, which is imbricated, at first very short and scale-like. Stamens double the number of the petals, dilated at the base, sometimes naked, usually placed on the back of a small scale, hypogynous. Ovary simple, surrounded at the base with glands or a short sinuous disk. More or less deeply 4- or 5-furrowed, with 4 or 5-cells; ovules in each cell 2 or more, attached to the inner angle, pendulous, or occasionally erect; style simple, usually with 4 or 5 furrows; stigma simple, or with 4 or 5 lobes. Fruit capsular, rarely somewhat fleshy, with 4 or 5 angles or wings, bursting by 4 or 5 valves bearing the dissepiments in the middle, or into as many close cells; the sarcocarp not separable from the endocarp. Seeds usually fewer than the ovules, either compressed and scabrous when dry, or ovate and smooth, with a thin herbaceous integument. Embryo green; radicle superior; cotyledons foliaceous; albumen in small quantity, whitish, between horny and cartilaginous, in *Tribulus* wanting.

These plants are remarkable in the Rutal Alliance for their opposite leaves and conspicuous stipules. With Quassiads they otherwise accord in the stamens springing from the back of a hypogynous scale. *Adrien de Jussieu* also observes that the petals are remarkable for their being, in an early state, minute and hidden by the calyx, which they only exceed about the time of flowering, while in other Rutal Orders the petals are always larger than the calyx. The distinguishing characters in the vegetation or habit of this Order are not only the leaves being constantly opposite, with lateral or intermediate stipules, but also in their being generally compound, and always destitute of the pellucid glands which universally exist in true Rueworts. For this reason the genus *Biebersteinia* must be excluded, although

its leaves have stipules. It is also a very common character of the Order to have the radicle at that extremity of the seed which is most remote from the hilum; but this, which is of great importance in many natural families, is of less value in Beancapers. (See many good remarks upon this subject in *Brown's Appendix to Denham*, p. 27.) An anonymous author expresses his opinion (*Linnaea*, xv. 249.) that the true affinity of this Order is with Oxalids, not Rueworts. He would not however keep them in the neighbourhood of Cranesbills, but thinks Mallowworts their true relations.

*Guaiacum*, *Porlieria*, and *Larrea*, are peculiar to America. *Fagonia* is distributed over the south of Europe, the Levant, Persia, and India. *Zygophyllum* inhabits the same regions, and also the south of Africa, and is represented in New Holland by *Röpera*. *Tribulus* occurs in all the Old World within the tropics, or in countries bordering upon them. *Melanthus*, a most anomalous genus, is remarkable for being found both at the Cape of Good Hope and in Nipal, without any intermediate station. The abundance of Beancapers constitutes one of the most striking features of the vegetation of the Egyptian deserts.

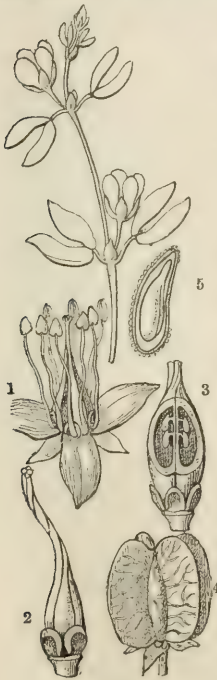


Fig. CCCXXXI.

Fig. CCCXXXI.—*Röpera fabagifolia*. 1. a flower; 2. pistil; 3. perpendicular section of it; 4. fruit; 5. section of a seed.



*Zygophyllum Fabago* is sometimes employed as an antihelminthic. The *lignum vitae* of the Order are remarkable for the extreme hardness of their wood. All the *Guaiacum*s are well known for their exelling properties; the bark and wood of *Guaiacum sanctum* and officinale have a somewhat bitter and acrid flavour, and are principally employed as sudorifics, diaphoretics, or alteratives; they contain a particular matter called Guaiacine. According to Dr. Hancock (in the *gardener's Chronicle*), the highest value of *Guaiacum* resides principally in the bark. The foliage is very detergents, and is frequently used in the West Indies to scour and whiten floors, which it is said to do better than soap. *Portiera hygrometrica* has similar properties. The wood called *Lignum vite* is remarkable for the direction of its fibres, one layer of which often crosses another diagonally; a circumstance first pointed out to me by Professor Vahl. This valuable timber is generally said to be furnished by *Guaiacum officinale*; but it is probably the wood of some other species, for the small size of that tree seems quite incompatible with the production of timber 4 or 5 inches in diameter.—*See Bot. Res. &c.* The flowers of *Melanthus major* are so full of honey, that the natives of the Cape at Good Hope, where it grows wild, obtain it for food by shaking the branches, when it falls in a heavy shower. The flowers of *Zygophyllum Fabago* are a substitute for Capers; the smell of *Z. simplex* is so detestable that no animal will touch the foliage, not even the camel; the Arabs, however, beat the leaves in water, and apply the infusion in diseases of the eyes. The Turks use the seeds of *Peganum Harmala* as a spice, and for dyeing red.

#### GENERA.

I. TRIMLEAF. = Seeds without albumen.	II. ZYGOPHYLLACEÆ. Seeds with albumen.	III. <i>Trichostema</i> , Thunberg.	IV. <i>Trichostema</i> , Thunberg.
<i>Tribulus Terrestris</i> .	<i>Peganum</i> , L.	<i>Sarcocolla</i> , DeCand.	<i>Farfara</i> , Linn.
<i>Kalistromia</i> , Scop.	<i>Harmala</i> , Michx.	<i>Rapana</i> , Hoffm. & Less.	<i>Portiera</i> , Rostk. & Schmidt.
<i>Thrysochloa</i> , Mart.	<i>Makassaricus</i> , F. & M.	<i>Zygophyllum</i> , Linn.	<i>Phytolacca</i> , Gaertn.
<i>Heterocarpus</i> , Bunge.	<i>Chitonia</i> , Moench & Suss.	<i>Fabago</i> , Tournefort.	<i>Orthocentrus</i> , Linn.
	<i>Jasminum</i> , Linn. et Less.	<i>Azobellum</i> , Naud.	<i>Sarcocolla</i> , L. & M.
		<i>Eurytema</i> , Hoffm.	<i>Melanthus</i> , L.

NUMBERS. GEN. 7. Sp. 169.

POSITION.—Simarubaceæ.—ZYGOPHYLLACEÆ.—Elatinaceæ.  
*Quadrifida*, L.

#### ADDITIONAL GENERA.

*Trichostema*, R. R. and Tribulus.  
*Sarcocolla*, Linn.

See Planchon's observations on *MELANTHUS* in *Linnæa Transactio.* XX. 40.



## ORDER CLXXXI. ELATINACEÆ.—WATER-PEPPERS.

Elatinæ, *Cambessèdes* in *Mém. Mus.* 18, 225. (1829); *Aug. de St. H. Fl. Bras.* 2, 159. (1830); *Fl. Seneg.* 1, 42. (1832); *Fischer and Meyer in Linnaea*, x, 69. (1835); *Wight Illustr.* 1, t. 25; *Endl. Gen.* ccxix.; *Meisner Gen.* p. 131; *Fenzl Darstellung, &c.*, p. 30.

DIAGNOSIS.—*Rutal Exogens*, with a many-seeded fruit which is finally apocarpous, and polypetalous flowers.

Little annuals, growing in marshy places, with fistular rooting stems. Leaves opposite, with stipules between the petioles. Sepals 3-5, imbricated, distinct, or slightly connate at the base. Petals of the same number as the sepals, imbricated, hypogynous. Stamens hypogynous, usually twice as numerous as the petals. Ovary with from 3 to 5 cells, an equal number of styles, and capitate stigmas; ovules 00, anatropal. Fruit capsular, 3-5-celled, opening at the sutures, crowned by the styles; the valves either flat at the edge, or rolled inwards and alternating with the angles of a central placenta. Seeds 00, without albumen, wrinkled transversely, cylindrical, with a straight embryo, whose radicle is turned to the hilum, which is at one end of the seed.



Fig. CCCXXXII.

which *Alsinaceæ* form a part. On the contrary, the species agree much better with *Tutsans* (*Hypericaceæ*) even in the presence in the leaves of receptacles of resinous secretions; but they differ in having a persistent central axis in the fruit, and definite stamens, on which latter account they fall into the ranks of the *Rutal* rather than the *Guttiferal Alliance*. This view of their affinity seems confirmed by the curious genus *Tetradiclis*, a Syrian plant, with the habit of a *Tillæa*, on which account it has been even referred to the Order of *Houseleeks* by Bunge (*Linnaea*, xiv. 177). It is remarkable for having in each cell of its fruit two seeds enveloped in the laminated sides of the dissepiments, which sides adhere to the seeds, and seem as if they were really a part of them; the other seeds, however, are naked, and lie in the space between the lateral seeds. If it were not for this singular breaking up of the tissue of the dissepiments, *Elatine* would be very near *Tetradiclis*. Now, there can be no doubt of the latter genus being a member of the *Rutal Alliance*; but its numerous seeds attached to two arm-like free placentæ forbid its being stationed in *Rueworts*, whither Mr. Fenzl has referred it (*Linnaea*, xv. 295), or in *Bean Capers*, among which I had assigned it a doubtful place in the Botany (still unpublished) of Col. Chesney's Expedition to the Euphrates. It falls, however, well into the Order of *Water-peppers*, and contributes to confirm the importance of that little Order.

Found in marshes in the four quarters of the globe. The *Elatines* are natives of Europe and Asia, *Bergias* of the Cape of Good Hope and the East Indies, *Merimea* of South America, and *Tetradiclis* of the Syrian region.

Dr. Wight says that in India the little *Bergia ammannioides* bears the Tamool name of *Neer-mel-neripoo*, or *Water-fire*, which seems a curious coincidence with the word *Water-pepper*, given in English to *Elatine*, and seems to indicate a popular belief in these plants possessing some acridity.

Fig. CCCXXXII.—*Elatine hydropiper*.—*Souerby*. 1. a flower; 2. a capsule after splitting; 3. the placenta; 4. and 5. seeds.



I observe that Dr. Ruge considers Ehrenberg's genus *Asutrops* (identical with *Yucca-*  
*diels*). M. Desfontaine long since pointed out to me the obvious mistake (but some years ago)  
and at the same time expressed his opinion that the former would constitute a new  
Order between Ruscaceæ and Ebenaceæ. But since *Asutrops* has atrophied, according  
to Ehrenberg, it seems premature to combine them.

GENERA.

<i>Elatine</i> , Lam.	<i>Zeyheria</i> , Brandl.	<i>Stemodia</i> , Thunb.	<i>Euphorbia</i> , Steud.
<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.
<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.
<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.	<i>Asutrops</i> , Nutt.

Nomenclature, G. & S. 22.

POSITION. — Zygophyllaceæ. ELATINACEÆ. — Podostemaceæ.  
*Elatine*, Lam.

S. — Southern in America. *Asutrops*, Nutt. 1818, p. 22.



## ORDER CLXXXII. PODOSTEMACEÆ.—PODOSTEMADS.

Podostemæ, Richard and Kunth in Humb. N. G. et Sp. 1. 246. (1815); Martius Nov. G. et Sp. 1. 6. (1822); Barth. Ord. Nat. 72. (1830); Bongard in Mem. de l'Acad. Imp. Petersb. VI. ser. III. 69. (1834); Endl. Gen. lxxxv.; Meisn. Gen. p. 122.; Griffith in Ann. Sc. Nat. ser. II. 9. 183.

DIAGNOSIS.—*Rutal Exogens*, with many-seeded fruit, which is finally apocarpous, and apetalous very imperfect flowers.

Herbaceous branched floating plants without stomates or spiral vessels, and with the habit of Liverworts or Scale-mosses. Leaves capillary, or linear, or lacerated irregularly, or minute and densely imbricated, decurrent on the stem, with which they are not articulated. Flowers axillary or terminal, inconspicuous, usually ♀, naked, or with a very imperfect calyx, or with 3 sepals bursting through an irregularly lacerated spathe. Stamens hypogynous, varying from 1 to an indefinite number, either placed all round the ovary or on one side of it, distinct or monadelphous; anthers oblong, 2-celled, bursting longitudinally. [Pollen shaped like an hour-glass, consisting of two spherules, inseparably united in Podostemon.—Griffith.] Ovary 2- or 3-celled, with numerous ascending anatropal ovules attached to a fleshy central placenta; styles or stigmas 2 or 3, acute and sessile. Fruit slightly pedicellate, ribbed, capsular, opening by 2 or 3 valves, which fall off from the dissepiment, which is parallel with them. Seeds numerous, minute, containing an exalbuminous dicotyledonous orthotropal embryo.

Von Martius has the following remarks upon this curious Order. "It is very doubtful in what part of the natural series Podostemads should be arranged; for they are connected with so many other Orders, in so various and complicated a manner, that it is probable that several genera, the affinities of which will be more apparent, still remain to be discovered. Nothing can be more singular than the mixture of different characters which they exhibit. Thus, the structure of their spathes, and the want of a true calyx and corolla, approximate them to Naiads (Fluviales) and Arads, while the character of their stamens and fruit is very much that of Juncaginaceæ; the former of these, however, differ in their lower degree of organisation, and the latter in the presence of a more or less perfect perianth, and in the composition of their capsule. Lemna, a genus closely allied to Arads, seems to be more related to them in its spathe, hypogynous stamens, habit, and mode of life, but is distinguished by its less highly developed few-seeded fruit. Again, Mniopsis, in its ramification, in the form and position of its leaves, and in its stipules, and Lasis and Podostemon in the character of their spathe and the emersion of their pedicels at the time of flowering, call remarkably to mind the habit of Jungermannia; so that we should probably not be far from the truth, if we were to say that this Order forms a transition from Naiads (Fluviales) to Juncaginaceæ, on the one hand touching upon Arads, and being, as it were, a sort of noble analogy of Liverworts among Monocotyledons."—Nov. G. et Sp. 1. 7. So far as the general appearance of Podostermads is concerned, this account of them may be received; but since they have a dicotyledonous not monocotyledonous embryo,

other affinities must be looked for. Bongard first represented their true structure, and more recently Mr. Griffith has described two Indian species of Podostemon, with his habitual accuracy; entirely confirming the view which I upon mere theoretical reasoning formerly took of their being Exogens.—Ed. pr. p. 190. And I am still of opinion that if we have among Exogens one type of structure more nearly approaching that of

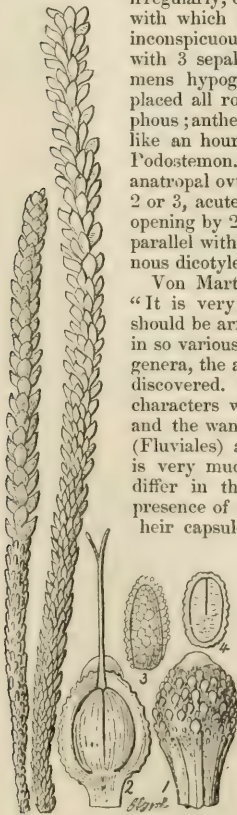


Fig. CCCXXXIII.

Fig. CCCXXXIII.—The ♀ of *Hydrostachys verruculosa*. 1. the calyx; 2. the same opened to show the ovary; 3. a seed; 4. a vertical section of it.—Decaisne.



Aerogens than another it is this, which, with the habit of Liverworts and Sadder-mosses, has wholly the structure of flowering plants. According to Linnaeus, the species have neither spiral vessels nor stamates; the latter would of course be absent, on account of the submersed habits of the species of *Moniera* to which the character chiefly apply. And Mr. Griffith confirms his statements as regards his two former *Podostemads*. But although *Podostemads* must be considered to present a very strongly marked approach to flowerless plants in some respects, yet we must look for some more immediate relation. This I formerly thought might be found with Peppers, or *Callitriche*; Meisner suggests *Hieracium*. But if we regard hermaphrodite flowers, hypogynous stamens, and an exalbuminous embryo as the most important features in these plants, our views of its affinity will take a very different direction, and we can scarcely fail to suspect an approach to Waterpeppers, whose manner of life is in many respects similar. In fact, upon comparing the two Orders, we find that they are otherwise much alike, except that *Podostemads* are more incompletely formed in the floral envelopes, and seem to want the capitate stigmas of that Order. Both have 2-celled anthers bursting inwards longitudinally, and a separable placenta bearing numerous anatropal seeds. It seems, therefore, probable that *Podostemads* stand in the same relation to Waterpeppers as *Hippuris* to *Oncagrad*, and *Lemna* to *Arace*.

Such was the view I took, in the year 1846, of the structure and possible affinities of this singular order. Since that time one of the most remarkable men in whose science knows, alike valuable for minute observation, and the admirable illustration which accompany it, has been published by M. Tulasne (*Monographie Podostemacearum*, 4to. Paris, 1852). What follows is founded upon this able monograph.

Spiral or spiroidal vessels do exist; but only in small quantities, and not at all in the leaves. *Hydrostachys* alone is unisexual. The pollen is spherical, with many pores, or elliptical, 2-celled and 4-furrowed. The ovary is 2-3-celled with parietal or axile placentation, and indefinite ovaries. The number of stamens, which are terminal and subulate, equals the number of carpels composing the gynoecium.

The affinity of the order M. Tulasne leaves still uncertain. In addition to the preceding speculations I would only observe that it is worth considering whether *Podostemads* may not be in reality more nearly related to Liliaceæ than has been supposed, bearing to Plantaginaceæ an affinity not unlike that of *Glossy* to *Primulaceæ*.

The species are all submersed, and chiefly found in rapids and by the side of torrents, on stones, &c.; rarely in stagnant, and never in salt water. They are chiefly South American, as far as discovery has yet extended; some are from the Mascarene Islands; some from tropical India; one from N. America; and there is reason to suppose that even in Europe a species (*Apinagia Pressii*) may lurk in the floods of the coast of Venice.

Their uses are unimportant. Some species of *Lacis* yield according to Schomburgk, when burnt, much salt in their ashes; and Spruce reports that those which inhabit the falls of the Rio Negro are a chief article of support to the natives for one half the year (*Hood's Journal*, IV. 281). Purdie found that the cattle of New Guinea feed greedily upon the leaves of *Manathrum utile* and *Schizocaulum*. And the pygmy fish called in Guayana *Pakou* and *Coumarou* are said to owe their great quality to their pasturing upon *Mourea*, and other *Podostemads*.

#### GENERA

##### I. HYDROSTACHYDACEÆ

*Hydrostachys*, Pol. Tr.

##### II. LACISACEÆ

*Moniera*, Aubl.

*Stachys*, Nees.

*Lacis*, Aubl.

*Lacis-stachys*, Pol.

*Monieria*, H. B. K.

*Rhipidoloma*, Pol.

*Lacis*, Pol.

*Chama*, Pol.

*Apinagia*, Pol.

*Lacis*, Pol.

*Dryas*, Pol.

*Monstylis*, Pol.

*Podostemum*, K. & L.

*Hydrobryum*, Pol.

*Mniopsis*, Pol.

*Gracilaria*, Spring.

*Gracilaria*, Pol. & H. B. K.

*Dryas*, Pol. & H. B. K.

*Schizocaulum*, Pol.

*Gracilaria*, Pol. & H. B. K.

##### III. Rhipidolomaceæ

*Rhipidoloma*, Pol.

*Rhipidoloma*, H. B. K.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

*Rhipidoloma*, Pol.

Numbers. Ges. 21. Sp. 100.

*Macrorhynchus*.

Position.—Elatinaceæ.—Podostemaceæ.—Pieraceæ.

*Pieraceæ*.



# ALLIANCE XXXVI. GERANIALES.—THE GERANIAL ALLIANCE.

**DIAGNOSIS.**—*Hypogynous Exogens, with monodichlamydeous, symmetrical flowers, axile placentæ, an imbricated calyx, a twisted corolla, definite stamens, and an embryo with little or no albumen.*

If we seek for a positive character by which the present Alliance may be known from its relations, we shall find it in the combination of three circumstances, viz: a definite number of stamens, an imbricated calyx, and a twisted corolla. Malvals have a twisted corolla, but their stamens are usually indefinite and their calyx is always valvate; for which latter reason Indian Cresses are removed from the Geranial Alliance. Rutals have definite stamens and an imbricated calyx, but their corolla is imbricated, not twisted.

The only doubtful Order of the Alliance is that of Chlenads, which in habit is like some Sterculiads; but it corresponds with Balsams in their unsymmetrical flowers, and it has not a stronger relation to any Malval than to the Order of Geranials. Chlenads may perhaps be regarded as a kind of approach on the part of Geranials to the Malval Alliance.

## NATURAL ORDERS OF GERANIALS.

<i>Flowers symmetrical. Styles distinct. Carpels longer than the torus. Seeds with little or no albumen.</i>	183. LINACEÆ.
<i>Flowers regular, unsymmetrical, with a permanent cup-like involucre. Stamens monadelphous. Albumen abundant.</i>	184. CHLENACEÆ.
<i>Flowers symmetrical. Styles distinct. Carpels longer than the torus. Seeds with abundant albumen.</i>	185. OXALIDACEÆ.
<i>Flowers very irregular and unsymmetrical, without an involucre. Stamens distinct. Albumen none.</i>	186. BALSAMINACEÆ.
<i>Flowers usually symmetrical. Styles and carpels combined round a long beaked torus.</i>	187. GERANIACEÆ.

**NOTE.**—Many observations and suggestions respecting the limits of these Orders, by M. Planchon, will be found in the *London Journal of Botany*. Vols. VI. and VII.



## ORDER CLXXXIII. LINACEÆ.—Flaxworts.

*Lineæ, in Tabulæ, vol. 3. 237 (1806). Endl. in Arch. Botani, 1. 224 (1844). Reichenb. in Ann. d. Bot. Syst., 1. 161 (1824).*

**Diagnosis.**—*Stemless Herbage, with axillary flowers, distinct sepals, petals longer than the fruit, and seeds with little or no albumen.*

Annual or perennial plants, or even small shrubs. Leaves alternate or opposite, rarely in whorls, simple, entire, without stipules, sometimes with a pair of bracts. Flowers very fugitive, white, yellow, red, or blue; sepals 3-4-5, with an indurated or cartilaginous, sometimes with the perianth, persistent. Petals equal in number to the sepals, hypogynous, unguiculate, with a twisted or twisted. Stamens equal in number to the petals, and alternate with them, united at the base in a hypogynous ring, from which proceed little teeth opposite to the petals, indicating abortive stamens; anthers ovate, innate. Ovary with about as many cells as sepals, seldom fewer; styles equal in number to the cells; stigmas capitate; ovaries pendulous, anatropal. Capsule generally pointed with the indurated base of the styles, many-celled; each cell completely or partially divided in two by an imperfect aperturous dissepiment arising from the dorsal suture; dehiscing with two valves at the apex. Seeds in each cell single, compressed, inverted; albumen 0, or in a very small quantity; embryo straight, fleshy, with the radicle pointing towards the base; epiblastematous.



FIG. CCXXXIV.

It is remarked by De Candolle that this Order is intermediate, as it were, between Cloveworts, Mallowworts, and Cruciferales. Aug. de St. Hilaire considers it a mere section of the latter, from which however it is removed by its continuous stem, exstipulate leaves, and naked fruit. Its nearest affinity is with Oxalids, to which there is little to divide it except the peculiar structure of its capsule, whose aperturous dissepiments are however scarcely of ordinal importance, its simple leaves, and the very small quantity of albumen found in the seeds. It is not without resemblance to Waterpeppers, to which I formerly suggested that Flaxworts might be an exsiccated descendant form.

Larpe and the North of Africa are the principal stations of this Order, which is, however, scattered more or less over most parts of the globe. It occurs extensively in North and South America, 2 only are found in India, 1 in New Zealand, and none in New Holland; for the *L. angustifolium* mentioned by De Candolle as having been sent from that country, had probably, as he suggests, been introduced from Europe. It is stated by Richardson that the most northern limit of this Order in North America is 54° N.

The pungency of their fibre, and the medicinal qualities of their aquatic seeds, are striking characters of Flaxworts, which are also usually remarkable for the beauty of their flowers. The leaves of *L. catharticum* are purgative. Linum catharticum is considered in Peru bitter and aperient. The meal of the seeds of *Linum catharticum* is used for pedicels. The infusion is demulcent and emollient. The oil derived from flax-water has been a favourite application to horses. The pumice and white flax called Flax is obtained from that plant, and forms the most beautiful of soft linen weaving

## GENERA.

*Linum, Linn.*  
*Catharticum, Rostk.*  
*Catharticum, Rostk.*

*Linum, Rostk.*  
*Catharticum, Rostk.*  
*Catharticum, Rostk.*

*Catharticum, Rostk.*  
*Catharticum, Rostk.*  
*Catharticum, Rostk.*

NUMBERS. GEN. L. 87. 39.

POSITION.—Oxalidaceæ. *Linaceæ*.  
*Linaceæ*.  
*Linaceæ*.

FIG. CCXXXIV.—*Linum catharticum*. 1. A single flower. 2. A dissected flower, showing the stamens and ovary. 3. A cross-section of the ovary. 4. A single seed, compressed and inverted.



## ORDER CLXXXIV. CHLÆNACEÆ.—CHLÆNADS.

Chlænaceæ, *Thouars' Hist. Veg. Afr. Austr.* 46. (1806); *DC. Prodr.* 1. 521. (1824); *Endl. Gen. cciv.*; *Meisner, p. 35.*

DIAGNOSIS.—*Geranial Exogens*, with regular unsymmetrical flowers, in a permanent cup-like involucre, monadelphous stamens, and abundant albumen.

Handsome trees or shrubs, with fine showy flowers usually of a red colour. Leaves alternate, feather-veined, entire, sometimes plaited longitudinally; stipules terminating the branches in a conical way, and rolling up or inclosing the leaves, quickly deciduous. Flowers in corymbs, racemes or panicles. Involucre 1-2-flowered, persistent, of variable form and texture. Sepals 3, small; aestivation imbricated. Petals 5, hypogynous, convolute, broader at the base, sometimes cohering there. Stamens either very numerous, or sometimes only 10; filaments either cohering at the base within a cup-like disk, or adhering to the tube of petals; anthers roundish, adnate, or loose, 2-celled. Ovary single, 3-celled; style 1, filiform; stigma triple; ovules 2 or more, anatropal, pendulous from the inner angle. Capsule 3-celled, or 1-celled by abortion. Seeds solitary or numerous, attached to the centre, suspended; embryo green, central; albumen fleshy according to Jussieu, or horny according to Du Petit Thouars; cotyledons foliaceous, wavy; radicle superior.

These are very curious plants, presenting the singular properties of 3 in the calyx, 5 in the corolla and stamens, and 3 in the ovary; besides which, their flowers are inclosed in an involucre, which is usually 5-toothed. The monadelphous stamens and involucrated flowers seem to indicate an affinity between these plants and Mallowworts. But Jussieu refers the Order rather to the vicinity of Ebenads, considering it monopetalous. Very little is, in fact, known of it. I formerly supposed it to have some relation to the Rock-roses (*Cistaceæ*), having had no opportunity of examining the plants myself. The acquisition of 2 or 3 species has, however, satisfied me, that if the calyx were valvate the Chlænads could not be removed from the Malval Alliance. The tendency of their calyx being, however, to the imbricated structure, the Geranial Alliance necessarily becomes their station, where they may be regarded as a connecting link with Malvals. The propriety of placing them in the Geranial Alliance seems to be confirmed by Balsams exhibiting a similar tendency to the unsymmetrical structure.

Whatever the real place of this group may eventually prove to be, it is certain that



Fig. CCCXXXV.

Fig. CCCXXXV.—*Leptolena multiflora*. 1. a perpendicular section of its flower; 2. a diagram of its structure; 3. a section of its seed.



Mr. Endlicher has destroyed all ideas of its nature, by introducing such plants as *Hugonia*, *Ventenatia*, and *Imeryphia*, which are natural associations, the one belonging to Oxalids, the second possibly to Thosels, and the last being certainly not Geraniaceae from the Order of Tuteaux, if it be distinguishable.

All the species are natives of Madagascar.

Nothing is known of their uses.

#### GENERA.

*Schizocaulis*, *Thomsonia*.

*Imeryphia*, *Thomsonia*.

*Schizocaulis*, *Thomsonia*.

*Rhododactylis*, *Thomsonia*.

NUMBERS. GEN. 1. S(1) 1.

POSITION. — Balsaminaceae. — C. 11. 1. 1. 1. 1.

*Schizocaulis*.



## ORDER CLXXXV. OXALIDACEÆ.—OXALIDS.

*Oxalideæ*, DC. *Prodr.* 1. 689. (1824); *Endl. Gen.* cclvi.; *Meisner Gen.* 57.—*Ledocarpeæ*, *Meyen Reise.* 1. 307.; *Klotzsch in Linnaea* 10. 431.; *Endl. Gen.* p. 1163.—*Rhynchotheceæ*, *Endl. Gen.* p. 1163.—*Hugoniaceæ*, *Arnott Prodr. Fl. Ind. Pen. us.* 1. 71. (1834); *Ed. pr.* lxxvii.; *Wight Illustr.* 1.; *Endl. Gen.* p. 1016; *Meisner*, p. 35.

**DIAGNOSIS.**—*Geranial Exogens*, with symmetrical flowers, distinct styles, carpels longer than the torus, and seeds with abundant albumen.

Herbaceous plants, undershrubs, or trees. Leaves simple or compound, alternate, usually but not always without stipules; occasionally opposite. Sepals 5, sometimes slightly cohering at the base, persistent, imbricated. Petals 5, hypogynous, equal, unguiculate, with a spirally-twisted aestivation; occasionally 0. Stamens 10, usually more or less monadelphous, those opposite the petals forming an inner series, and longer than the others; anthers 2-celled, innate. Ovary with 3 to 5 cells; styles as many, filiform; stigmas capitate or somewhat bifid; ovules anatropal. Fruit capsular, membranous, or drupaceous, with 3-5 cells and as many or twice as many valves, if it is deliscent. Seeds few, fixed to the axis, sometimes inclosed within a fleshy integument, which curls back at the maturity of the fruit, and expels the seeds with elasticity. Albumen between cartilaginous and fleshy. Embryo the length of the albumen, with a long radicle pointing to the hilum, and flat cotyledons.



Fig. CCCXXXVI.

parts of Asia and in Europe. the world.

*Averrhoa Bilimbi* and the pinnated *Oxalis* called *Biophytum* have sensitive leaves. The chief quality of the typical species of this Order resides in their strong acidity, caused by oxalic acid, formed by them in great abundance; hence they are used as substitutes for Sorrel. In the Blimbing, and *Carambola* (*Averrhoa Bilimbi*, and *Carambola*), whose fruit is eaten in the East Indies, this acidity is intolerable to Europeans, who use them chiefly as pickles. On the same account several species of *Oxalis* are used in Brazil against malignant fevers. A species of *Oxalis* (*crenata*), found in Columbia, bears tubers like a Potato, and is one of the plants called *Arracacha*: the tubers are insipid, and not worth cultivation; the stalks of the leaves are intensely acid, and make an agreeable preserve. Another species, the *Oxalis Deppei*, has,

Fig. CCCXXXVI.—*Oxalis confertiflora*. 1. calyx; 2. stamens; 3. pistil; 4. seed and its section of *O. acetosella*.



however, shady woods, quite free from acidity, and abundant in the moist meadows in that of saline; these roots are as large as small *Parosela*, and are becoming common for culinary purposes. The species called *Oxalis brassicoides*, tetraphylla, and *tricuspidata* are reported to possess similar good qualities. Some European have lately gathered a *Oxalis sensitiva*, whose leaves are said to be pain and slightly irritating. *Hesperis Myrtus* too, an ornamental shrub of the Order, is of a very nature, but in a somewhat degree; its root smells like yucca, and is said to be *laxative*, *dephlogisticant*, and anticholeric. In certain species an irritability of an inveterate kind has been found as to cause them to be classed among Stimulant Plants. A certain *Isotria Med. Oxalis sensitiva* are the most remarkable; but the same irritability has been observed in Professor Moeren in the European *Oxalis stricta*.—*Ann. St. & N. N. 1810.*

## GENERA.

*Oxalis*, Linn.  
*Tropaeolum*, DC.  
*Alysicarpus*, Lam.  
*Isotria*, Koch.  
*Ceratophyllum*, Endl.

*Lappulastrum*, Desf.  
*Parosela*, Vahl.  
*Ceratophyllum*, Desf.  
*Ceratophyllum*, Kuntz.

*Woolleya*, Moench.  
*Malvastrum*, Gussone.  
*Trigonotis*, L.  
*Rhynchospora*, & c. p.

NUMBERS. Gen. 6. Sp. 325.

POSITION.—Linnaea. Oxalidaceæ.—Ceratophyllaceæ.  
*Zingiberaceæ.*

## ADDITIONAL GENERA.

*Isotriastrum*, Planchon. 1. *Isotriastrum*, Planchon. 1. *Isotriastrum*, Planchon. 1.  
*Isotriastrum*, Planchon. 1. *Isotriastrum*, Planchon. 1. *Isotriastrum*, Planchon. 1.  
*Isotriastrum*, Planchon. 1. *Isotriastrum*, Planchon. 1. *Isotriastrum*, Planchon. 1.

Bate, Planchon (*London Journal*, Vol. VI. 34) and Blouin (*Museum*, p. 241) regard *Hesperis* as the type of a peculiar group. The former would bring *Oxalis*, *Ceratophyllum*, and *Leguminosae* plants all into contact.

The *Mitochondria* or *Oxalis antiafricana* is largely employed in Abyssinia for the same purposes as *Cressa* (*Blouin*). The root tubers are used, and even in preference to the latter, which to some persons is unsupportably disgusting.—*Ann. Richard.*



## ORDER CLXXXVI. BALSAMINACEÆ.—BALSAMS.

Balsamineæ, Ach. Rich. Dict. Class. 2. 173. (1822); DC. Prodr. 1. 685. (1824); Lindl. Synops. 59. (1829); Röper de Floribus et Affinitatibus Balsaminearum, (1830); Wight and Arnott, Prodr. Fl. Ind. Penins. 1. 134. (1834); C. B. Presl. Bemerkungen über den bau der Blumen der Balsamineen. (1836); Wight and Röper Linnæa ix. 112. (1835); Bernhards, ib. xii. 669. (1838); Kunth in Mém. Soc. Hist. Nat. Par. iii. 384. (1827); Wight in Madras Journal (Jan. 1837); Lindl. in Bot. Reg. sub. t. 8. (1840); Endl. Gen. cclvii.; Meisner Gen. p. 58.—Hydrocereæ, Blume Bijdr. 241. (1825); Ed. Prior, No. 125. (1830).

DIAGNOSIS.—*Geranial Exogens, with very irregular and unsymmetrical flowers without an involucre, distinct stamens, and no albumen.*

Succulent, usually annual, herbaceous plants, having simple, opposite, or alternate leaves, without stipules. Peduncles axillary, or quasiterminal and racemose. Flowers very irregular. Sepals 5, irregular, deciduous, with an imbricated æstivation; the two exterior opposite, lateral, somewhat unsymmetrical, with a valvate æstivation, but giving way for the projection of the spur of the odd sepal; the odd sepal spurred, symmetrical, with an equitant æstivation in the bud, looking towards the axis of the axillary racemose or umbelate inflorescence, containing honey; the two dorsal sepals usually connate, sometimes unsymmetrical, orbicular, always coloured, appearing at that side of the flower which is opposite to the spurred sepal. Petals either distinct or adhering, 5, combined into 2 or 3, irregular, deciduous; the dorsal usually abortive, and the side ones united more or less in pairs; their two larger lobes next the spur, their two smaller next the odd petal; æstivation convolute. Stamens 5, symmetrical, alternate with the petals. Carpels 5, alternate with the stamens, consolidated into a 5-celled ovary; style clear of the carpellary leaves, simple; stigma sessile, more or less divided in 5; cells 5, 2- or many-seeded. Fruit capsular, with 5 elastic valves, and 5 cells formed by membranous projections of the placenta, which occupies the axis of the fruit, and is connected with the apex by 5 slender threads; sometimes succulent and indehiscent. Seeds solitary, or numerous, suspended; albumen none; embryo straight, with a superior radicle and plano-convex cotyledons.

The Balsams are, in the opinion of some Botanists, scarcely distinguished from Cranesbills. But the latter evidently differ in the torus or gynobase being lengthened into a beak, in their leaves having stipules, their stems swollen articulations, and their carpels but one seed in each cell. Their flowers too have none of the peculiar breaking up of symmetry which is so characteristic of Balsams, and which at once divides them from even Oxalids, to which they certainly approach very nearly.

Much discussion has taken place among Botanists as to the real nature of the parts which constitute the very irregular flower of a Balsam. According to Röper and others, two membranous external scales, and a spur,

alone belong to the calyx, of which the two other sepals are usually deficient on that side of the flower which is opposite the spur; on the other hand, the corolla consists of a large upper or back piece, and of two lateral inner wings, each of which last consists of two petals; and this view was adopted in the last edition of this work. On the other hand, Achille Richard considers two smaller exterior scales, together with the spurred and the back interior pieces, as forming a four-leaved calyx, while he regards the two



Fig. CCCXXXVII.

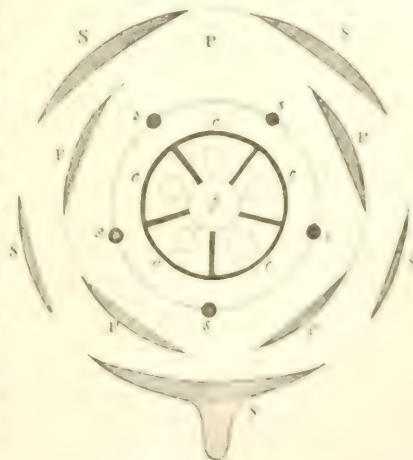
Fig. CCCXXXVII.—1. *Impatiens macrochila*; 2. a diagram of its flower; 3. its stamens; 4. fruit of *I. Balsamina*; 5. its embryo.



innermost lobed piece as two parts of petals of a four-leaved corolla. A third view is that of Bonbardier, who regards the exterior scales as bracts, the only one remaining of five parts, of which three only, namely the spur and the two back pieces which are distinct, are present, and the others rudimentary or missing; while the corolla also consists of five parts, of which the two lower are united in pairs with the two innermost lobed pieces, and the fifth is either separate, as in *Hydrocera*, or consolidated with the two back united sepals into what he calls a petal-sepal. A fourth view is that of Kunth, who considers the large back piece of the flower to be composed of two sepals, and together with the spur and exterior scales to form a five-leaved calyx; while he puts in the two innermost parts a corolla of four petals united in pairs, and he assumes the fifth petal to be abortive. This opinion has been adopted by Arnott in 1836, and by Presl in 1866, the latter having discovered the fifth or missing petal to be present occasionally in the garden Balsam, and always in *Hydrocera triflora*; both these Botanists finding in the genus *Hydrocera* the back piece, which is simple in *Impatiens*, composed of two parts, and therefore confirming the accuracy of the theory of Kunth. Other opinions, more or less resembling those, have been formed by others, but it is clear that Kunth's theory is the only one that is correct.

If we make a section horizontally through a young flower bud of *Impatiens nigræ-chila*, we find the following structure:—There is in the centre an ovary of five cells; with these alternate the five stamens, of which the fifth or anterior has a longer filament than the others; so far the structure is regular, and we have all the necessary evidence of the flower, however irregular, being formed upon a quinary type. Right and left of the stamens stand the two innermost pieces; these cannot be simple, because they are opposite the intermediate stamens; but their two-lobed figure, when full grown, shows that each is double, and then, their apparent centre being in fact their united margin, they alternate with the anterior stamens, and so fall into the place usually destined for petals. The last mentioned parts are half enveloped by the back piece, which might, from its position, be the fifth petal; but the case of *Hydrocera* showing it really to consist of two united parts, they must be opposite the stamens, and consequently are sepals. Next comes the spur, which overlaps the back piece, and stands opposite the anterior stamen; as no tendency to divide on the part of this piece is ever found, it must be a sepal. Finally, the external scales, placed right and left of the whole flower, alternate with those parts already shown to be sepals, and consequently are recognised as the two parts of the calyx required to complete the quinary plan of the whole flower. It will be remarked, that a fifth petal has not been found; if the eye is turned upon the back piece, already found to be composed of two sepals, it will be seen that a part is missing between those two and the two corresponding stamens; and this is the place where the abortion of a fifth of the corolla may, upon the evidence of this flower, be assumed to occur, and where it is proved to take place by the evidence of *Hydrocera*, in which the part missing in the Balsam makes its appearance.

The annexed diagram may serve to illustrate the preceding observations; the parts of the flower, as they really exist in *Impatiens* being projected upon a plane consisting of five circles, of which the exterior (S) represents the sepals or calyx, the next (P) the petals or corolla, the third (s) the stamens, the fourth (c) the carpels, and the central (p) the placenta, or axis.



Connected with these plants is a point of structure deserving of attention. In some species it will be found that the style is surrounded below its apex by five points, which are evidently continuations of the backs of the five carpellary leaves, which certainly in these plants are separate from the placenta, and are merely pressed down upon it so as to cover the ovules, thus confirming the accuracy of the views concerning placentation held by Schykofsky and Schleiden. If so, what else can the upper part of the style and the stigmas be, except the united axes of the placentæ.



prolonged beyond the carpellary leaves? And then is not the conducting tissue of a style in most cases an extension of the placenta? and may we not consider the indusium of Goodeniads, and, *à fortiori*, the well-known rim found upon the stigma in Heathworts, as the expanded end of the carpellary leaves, while the stigma of those plants is the upper end of the placenta?

Natives of damp places among bushes in the East Indies; 1 is found in Madagascar, 1 in Europe, 2 in North America, and 1 in Russia in Asia. India swarms with species, all of which deserve the care of the cultivator. According to Dr. Wight, (*Madras Journal*, January, 1837,) at least a hundred occur in those districts from which Roxburgh described only three. Forty-seven species are named by Wallich from Silhet, Pundooa, Nipal, and the Peninsula, and multitudes occur in Ceylon, and the islands of the Indian Archipelago. Dr. Wight states that a moist climate and moderate temperature are the circumstances most favourable, if not indispensable, to their production. At Courtallum, for example, they most abound in shady places on the tops of hills, with a mean temperature during the season of their greatest perfection not exceeding 70°, if so much. At Shevaggery, about fifty miles north of Courtallum, he found five out of seven species on the highest tops of the mountains, none of the five under 4000 feet, and three of them above 4500 feet of elevation; the mean temperature being 65° Fahr. Two found at a lower elevation, were both either growing in the gravelly beds of streams, or immediately on their banks; the temperature of which was ascertained to be 65°, while that of the air at noon was only about 75°.

The species are chiefly remarkable for the elastic force with which the valves of the fruit separate at maturity, expelling the seeds. For a supposed explanation of this phenomenon, see Dutrochet, *Nouvelles Recherches sur l'Exosmose et Endosmose*. According to De Candolle, they are diuretic; it is also said that the distilled water of *Impatiens Nolitangere*, taken in large quantity, brings on attacks of diabetes.

#### GENERA.

*Impatiens*, Linn.  
*Balsamina*, Gærtn.  
*Hydrocera*, Blum.  
*Tytonia*, Don.

NUMBERS. GEN. 2. Sp. 110.

POSITION.—Chlænaceæ.—BALSAMINACEÆ.—Geraniaceæ.  
*Tropæoluceæ.*

The root of *Impatiens tinctoria*, or *Ensesella*, consists of many fleshy oblong white tubers. In Abyssinia they are peeled and macerated for several hours either alone or mixed with lemons. The liquid acquires a black colour with which the inhabitants dye their hands and feet. After a time the fluid becomes reddish. A kind of cake made from this tuber is given to mules and horses, which are thus prevented from becoming lame in the barrel.—*Ach. Richard.*



Order CLXXXVII. GERANIACEAE.

Geometrische Optik 278 (1988) — GÖTTSCHEW, M., P. F. & S. S. (1988) — *Fractal Geometry*, Wiley, New York, 1988, 150 pp., \$19.95.

DIAGNOSIS. *Gymnastylis* *Europaea*, with strongly symmetrical flowers, small, and with very narrow, undivided corolla as long as the tube.

Herbaceous plants or shrubs. Stems terete, and separate at the joints. Leaves either opposite or alternate: in the latter case opposite the petioles, *orthostichous*.

stipules. Flowers white, red, yellow, or purple. Sepals 5, persistent, ribbed, more or less unequal, with an imbricated aestivation; sometimes truncate or spurred at the base. Petals 5, seldom 4, in consequence of 1 being abortive; unguiculate, twisted in aestivation, equal or unequal, either hypogynous or perigynous. Stamens usually monadelphous, hypogynous, twice or thrice as many as the petals; some occasionally abortive. Ovary composed of 5 carpels placed round a long awl-shaped torus or growing point, each 1-celled, 2-ovuled; styles 5, cohering round the torus and separable from it; ovules secundotropal, adhering to the torus. Fruit formed of 5 shells, cohering round a long beak.



PL. COCA, COCA.

torus; each piece containing 1 seed, having a membranous praeapex, and surrounded by an indurated style, when flexibly curls back from the base, up to the covering the pericarp along with it. Seeds solitary, without attachment. Embryo curved and doubled up; radicle pointing to the base of the seed; cotyledons tumid, cartilaginous, and plaited.

The long beak-like torus, round which the carpels are strongly, and the greenish membranous stipules at joints which are usually small, are the characters of the Order, and all plants not possessing these peculiarities must be excluded. *Samolus* is a South American genus called *Rhynchotheca*, which has been even observed in a Natural Order, but which is surely an Oxalid without pretence. In the fruit, observed in its fruit belongs to the carpels and not to the torus. It is also used in this Order the ovules do not spring from the margins of the carpillary haustel, &c. (see P. 1000).

Fig. CCXXXVIII. German. *Roburionus*. (Life size, 20 diam.); 5 specimens of 100 yrs.



half-ripe, when the embryo first appears in the albumen as a pale green line. At that time the carpels may be taken away from the ovules, leaving the latter adhering to a central placenta, and this may be done without at all disturbing or tearing the margin of the carpellary leaves. The suspended position of the seed has been given as a general character of Cranesbills; but the position of the ovules varies according to species in the genera *Erodium* and *Geranium*; and in consequence of the inequality of growth the seed is always ascending in the capsule.

The species are very unequally distributed over various parts of the world. A great proportion is found at the Cape of Good Hope, chiefly of the genus *Pelargonium*; *Erodium* and *Geranium* are principally natives of Europe, North America, and Northern Asia. It is worthy of remark that *Pelargonium* is found in New Holland.

An astringent principle and an aromatic or resinous flavour are the characteristics of this Order. The stem of *Monsonia spinosa* burns like a torch, and gives out an agreeable odour. In North Wales *Geranium Robertianum* has acquired celebrity as a remedy for nephritic complaints. The root of *Geranium maculatum*, or Alum-root, is a most powerful astringent, containing considerably more tannin than Kino. According to Bigelow, it is particularly suited to the treatment of such diseases as continue from debility after the removal of their exciting cause. The tincture is an excellent local application in sore throat and ulcerations of the mouth. Many others have a similar reputation, but are not used in modern medicine, especially species of the genus *Erodium*, among which *E. moschatum* is more especially remarkable for its powerful smell of musk. The *Pelargoniums* are chiefly noted for their beautiful flowers, but they, too, are astringents. *P. antidysentericum* is used as a remedy for diarrhoea among the Namaquas. One of the species with tuberous roots, of which many are known at the Cape of Good Hope, namely, *P. triste*, is eatable, and Mr. Backhouse speaks of the fleshy tubers of *Geranium parviflorum* being eaten by the natives of Van Diemens Land, where it is called the Native Carrot.

#### GENERA.

*Erodium*, Herit.  
*Scolopacium*, Eckl. et  
Zeyh.  
*Geranium*, Herit.  
*Monsonia*, Linn. f.  
*Odontopetalum*, DC.  
*Holopetalum*, DC.

*Sarcocaulon*, DC.  
*Pelargonium*, Herit.  
*Hoarea*, Sweet.  
*Dimacria*, Sweet.  
*Cynobata*, DC.  
*Peristera*, DC.  
*Otidia*, Sweet.

*Polyactium*, DC.  
*Isopetalum*, Sweet.  
*Campylia*, Sweet.  
*Phymatanthus*, Sweet.  
*Myrrhidium*, DC.  
*Jenkinsonia*, Sweet.

*Chorisma*, Sweet.  
*Ciconium*, Sweet.  
*Cortusina*, Eckl.  
*Eumorpha*, Eckl.  
*Calliopsis*, Sweet.  
*Anisopetalum*, DC.  
*Hypseocharis*, Rémy.

NUMBERS. GEN. 4. Sp. about 500.

(After deducting the hybrids introduced by De Candolle.)

*Tropæolacæ.*

POSITION.—Balsaminacæ.—GERANIACEÆ.—Oxalidacæ.

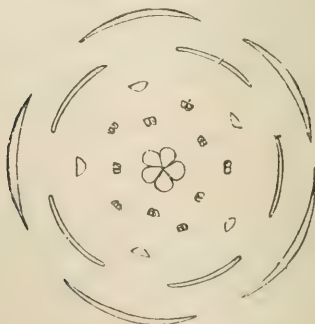


Fig. CCCXXXIX.

Fig. CCCXXXIX.—Diagram of the flower of *Geranium Robertianum*.



## ALLIANCE XXXVII. SILENALES. — THE SILENAL ALLIANCE.

DIAGNOSIS. *Hypogynous Exogens, with several stamens, a free central placenta, an external corolla curved round a little nearly adnate, and more than one carpel completely combined into a compound fruit.*

At this point a considerable advance in structure is evident among Exogens. Among these plants a corolla appears with all its fragrance and gaudy colours, and the ovary is constituted, not by the rolling up of a solitary carpellary leaf, but by the complete consolidation of several. The combining process is indeed carried occasionally so far among these plants as to divide the cavity of the ovary into distinct cells; but it is certain that the placentation is in all cases strictly central, no power being possessed by the carpellary leaves of generating oviduc on their margin or sides. A transition from the Chenopodials is supplied by Knotworts (*Illecebraceæ*), which are only Anacanthas of a higher grade. In several Orders the ovary may seem to be in many instances as simple as in the Chenopodial Alliance; but its compound nature is brought into evidence by the number of its separate stigmas or by the manner in which the seed-vessel splits when ripe.

## NATURAL ORDERS OF SILENALES.

<i>Calyx and corolla usually both present and symmetrical (4 and 4, or 5 and 5), the latter conspicuous. Ovales amphitropal.</i>	} 123. CARYOPHYLLACEÆ.
<i>Leaves opposite, without stipules</i>	
<i>Calyx and corolla usually both present and symmetrical (4 and 4, or 5 and 5), the latter rudimentary. Ovales amphitropal.</i>	} 122. HILDEBRANDIACEÆ.
<i>Leaves with scarious stipules</i>	
<i>Calyx and corolla both present and unsymmetrical (2 and 5), the latter usually conspicuous. Ovales amphitropal. Leaves alternate, succulent, without stipules</i>	} 120. PORTULACACEÆ.
<i>Calyx often coloured; corolla present or absent. Ovales orthotropal. Nut usually triangular</i>	
	121. FICUARIACEÆ.



## ORDER CLXXXVIII. CARYOPHYLLACEÆ.—SILENADS, OR CLOVEWORTS.

Caryophyllæ, *Juss. Gen.* 299. (1789); *De Cand. Prodr.* 1. 388. (1824); *Endl. Gen.* ccvii.; *Meisner Gen.* 24.—Sileneæ, *DC. Prodr.* 1. 351. (1824); *Bartl. Ord. Nat.* 305. (1830); *Braun in Ann. Sc. Nat.* 2. ser. xx. 170.—Alsineæ, *DC. Fl. Franc. Ed.* 3. 4. 766. (1805); *Bartl. Ord. Nat.* 204. (1830); *Fenzl. Versuch.* (1833).—Queriaceæ, *DC. Prodr.* 3. 379. (1828).—Minuartiæ, *Id.* (1828).—Molluginæ, *Fenzl. Monogr.*—Sieudeliiæ, *Id.*

DIAGNOSIS.—*Sileneal Exogens*, with symmetrical flowers, a conspicuous corolla, amphitropal ovules, and opposite leaves without stipules.

Herbaceous plants, occasionally becoming suffrutescent. Stems tumid at the articulations. Leaves always opposite and entire, often connate at the base. Flowers ♂, occasionally imperfect by abortion, variously arranged. Sepals 4-5, continuous with the peduncle, persistent, distinct, or cohering in a tube. Petals 4-5, hypogynous, unguiculate, inserted upon the pedicel of the ovary; frequently split into 2 parts, occasionally wanting. Stamens usually twice as many as the petals, sometimes equal in number to the sepals and opposite them, occasionally fewer, inserted upon the pedicel of the ovary along with the petals; filaments subulate, sometimes monadelphous; anthers innate, 2-celled, opening longitudi-

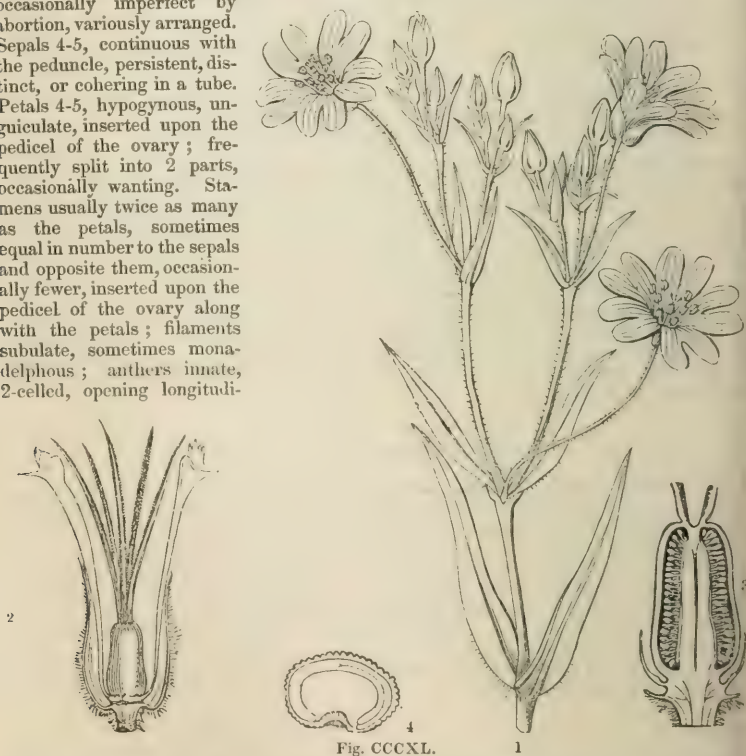


Fig. CCCXL.

nally. Ovary stipitate on the apex of a pedicel (called the gynophore), composed of from 2 to 5 carpels, whose edges are either adherent and valvate, or turned inwards so as sometimes to touch the free central placenta; stigmas 2-5, sessile, filiform; papillose on the inner surface; ovules few or 00, amphitropal. Capsule 2-5-valved, either 1-celled or 2-5-celled, in the latter case with a loculicidal dehiscence. Placenta central, in the 1-celled capsules distinct, in the 2-5-celled capsules adhering slightly to the edge of the dissepiments. Seeds indefinite in number, rarely definite; albumen mealy embryo external, curved round the albumen, sometimes straight, very rarely spiral with hardly any albumen; radicle pointing to the hilum.

Fig. CCCXL. 1. *Stellaria Holostea*; 2. pistil, calyx and petals of *Lychnis Flos Cuculi*; 3. vertical section of its pistil; 4. vertical section of its seed.



These plants, the greater part of which are temperate zone herbs, *Purslane* being which is readily known by its opposite undivided leaves without stipules, joint nodes, and two central placenta surrounded by several carpellary leaves. They mostly differ from *Purslans* except in their symmetrical flowers. In general appearance they much approach some of the species of the Geraniai Alliance, from which their free central placenta clearly divides them. That this placenta is really central as it is so termed by a beautiful monstrosity discovered by Mr. Eaton, and published by him in our *Gardener's Chronicle*, for 1844, p. 557, in which the carpellary leaves are partially turned inwards without touching the placenta, which bears a cluster of ovules and is perfectly clear of all connection with those partitions. There is a learned and important Memoir on these plants by Brunn (Ann. Sci. Nat. x. 156), to which the reader is referred for valuable details as to the limits of the genera.

In the succeeding Table of Genera, Sileneæ and Alsineæ are what all Botanists recognise as Cuckeworts; the *Molluginæ* consist of a portion of the *Purslane* tribe as it stands in Endlicher's *Genera Plantarum*, where it is broken up into *Polpoden* and *Adenogramma*, sections which it is scarcely desirable to maintain. The reasons which have led to this separation are given under the Order of *Purslans*.

Natives principally of the temperate and frigid parts of the world, where they inhabit mountains, hedges, rocks, and waste places. Those which are found within the tropics are usually met with on high elevations and mountainous tracts, almost always reaching the frigid eternal snow, where many of them exclusively vegetate. Since Silene has occurred in many different parts of the globe. According to the calculation of Humboldt, Cuckeworts constitute  $\frac{1}{2}$  of the flowering plants of France,  $\frac{1}{4}$  of Germany,  $\frac{1}{3}$  of England, and  $\frac{1}{2}$  of North America.

The species are in general remarkable for little except beauty. A few, such as *Dianthus* and *Lychnis*, are handsome flowers; but the greater part are more humble. *Vaccaria vulgaris* is said to increase the lactical secretions of a swollen mamma. It contains Saponine, as also does the Egyptian Soap root, which is derived from *Gypsophila Struthium*. *Als.* *Lychnis dioica*, and *L. clidochloea*, have also saponaceous properties; *Saponaria* has been used in syphilis. A decoction of the root of *Silene aconitifolia* is said to have been employed in North America as an antiscorbutic. *Silene Spaldingii* arvensis, is sometimes cultivated as food for sheep. *Gypsophila Struthium* is a condiment; *Silene Otites*, which is bitter and astringent, has been employed in dysuria. The seeds of *Vaccaria vulgaris* are said to be diuretic; those of *Astragalus triflorus* (the Corn-cockle), are reported to render corn unwholesome, when ground into flour.

# GENERA.

Suborder I. *Alsineæ*.—*Phlox*, Donnell.  
Sepals distinct, opposite. *Lychnis*, L. & L.  
Stamens the stamens, when *Butcher's*, *Silene*.  
The latter are of the *Butcher's* form.  
Quercus, *Lychnis*.  
Stamens *Butcher's*.  
Stamens *Butcher's*, *Butcher's*.

*Butcher's*, *Butcher's*.  
*Butcher's*, *Butcher's*.  
*Butcher's*, *Butcher's*.  
*Butcher's*, *Butcher's*.  
*Butcher's*, *Butcher's*.  
*Butcher's*, *Butcher's*.  
*Butcher's*, *Butcher's*.  
*Butcher's*, *Butcher's*.

FIG. CCCXII.—1. Monstrous flower of a *Caryophyllus*; 2. the light and stamens separate; 3. the ovary forced open to show the origin of the exocarp and the manner in which the ovules are attached; 4. a monstrous ovule.



*Psammophila*, Fenzl.  
*Triplateia*, Bartl.  
*Hymenella*, Moç. et Ses.  
*Honkenya*, Ehrh.  
*Halianthus*, Fries.  
*Haltia*, Dumort.  
*Ammonalia*, Desv.  
*Lepyrodiclis*, Fenzl.  
*Merckia*, Fisch.  
*Wilhelmsia*, Reichenb.  
*Dolophragma*, Fenzl.  
*Thylacosperma*, Fenzl.  
*Petandra*, Cambess.  
*Flourensia*, Cambess.  
*Bryomorpha*, Karel.  
*Arenaria*, Linn.  
*Eremogone*, Fenzl.  
*Euthalia*, Fenzl.  
*Plinthine*, Rchb.  
*Alsinanthus*, Desv.  
*Porphyranthus*, Fenzl.  
*Gouffea*, Robill. et Cast.  
*Dicranilla*, Fenzl.  
*Möhringia*, Linn.  
*Krascheninikovia*, Turcz.  
*Brachystemma*, Don.  
*Odontostemma*, Benth.  
*Holostium*, Linn.  
*Stellaria*, Linn.  
*Schizoteichium*, Fenzl.  
*Larbrea*, St. Hil.  
*Leucostemma*, Benth.

*Adenonema*, Bung.  
*Cerastium*, Linn.  
*Dichodon*, Bartl.  
*Schizodon*, Fenzl.  
*Strephodon*, Sering.  
*Orthodon*, Sering.  
*Esmarchia*, Reichenb.  
*Mönchia*, Ehrh.  
*Malachium*, Fries.  
*Myosoton*, Mönch.

Suborder II. *SILENEÆ*.—  
 Sepals united into a  
 tube, opposite the sta-  
 mens. when the latter  
 are of the same number.

*Velezia*, Linn.  
*Dianthus*, Linn.  
*Caryophyllum*, Endl.  
*Tunica*, Scop.  
*Kohlruschia*, Kunth.  
*Pseudotunica*, Fenzl.  
*Heliosperma*, Griseb.  
*Saponaria*, L.  
*Rootia*, Neck.  
*Proteinia*, Ser.  
*Gypsophila*, Linn.  
*Dichoglottis*, Fisch. et  
 Mey.  
*Hagenia*, Mönch.  
*Heterochroa*, Bung.

*Struthium*, Ser.  
*Rokejka*, Forsk.  
*Banffia*, Baumg.  
*Saponaria*, Fenzl.  
*Smegmanthe*, Fenzl.  
*Bolanthus*, Ser.  
*Cymanthus*, Endl.  
*Smegmathamnium*, Endl.  
*Silenanthe*, Fenzl.  
*Heliosperma*, Rchb.  
*Melandrium*, Fries.  
*Elisanthe*, Endl.  
*Gastrolachnis*, Fenzl.  
*Vaccaria*, Medik.  
*Eudianthe*, Rchb.  
*Ankyropetalum*, Fenzl.  
*Silene*, Linn.  
*Behenantha*, Otth.  
*Otites*, Otth.  
*Coniomorpha*, Otth.  
*Stachymorpha*, Otth.  
*Rupifraga*, Otth.  
*Siphonomorpha*, Otth.  
*Atocion*, Otth.  
*Viscaria*, Röhl.  
*Hymenanthe*, Fenzl.  
*Coronaria*, L.  
*Coccygonthe*, Rchb.  
*Agrostemma*, L.  
*Githago*, Desf.  
*Uebelina*, Hochst.  
*Petrocepsis*, Braun.

*Lychnis*, Tournef.  
*Hedeoma*, Lour.  
*Gastrolachnis*, Fenzl.  
*Cucubalus*, Tournef.  
*Scribæa*, Flor. Wetter.  
*Lychnanthus*, Gmel.  
*Drypis*, Michel.  
*Acanthophyllum*, C.A.M.

Suborder III. *MOLLU-  
 GINÆÆ*.—Sepals distinct  
 or nearly so, alter-  
 nate with the stamens  
 when the latter are of  
 the same number.

*Mollugo*, Linn.  
*Cerviana*, Minuart.  
*Trichlis*, Hall.  
*? Galiastrum*, Heist.  
*Pharnaceum*, Linn.  
*Ginginsia*, DC.  
*Hypertelis*, E. Mey.  
*Psammotropha*, Eckl. et  
 Zeyh.  
*Mallogonum*, Fenzl.  
*Cœlanthum*, E. Mey.  
*Acrosanthes*, Eckl. et Zey.  
*Schiedea*, Cham et Schl.  
*Colobanthus*, Bartl.  
*Polpoda*, Presl.  
*Adenogramma*, Reichenb.  
*Steudelina*, Presl.

NUMBERS. GEN.\*53. Sp. 1055.

*Geraniaceæ.*

POSITION. ——— CARYOPHYLLACEÆ.—Illecebraceæ.

*Malvaceæ.*

#### ADDITIONAL GENERA.

*Rhodalsine*, Gay, } near *Alsine*.  
*Greniera*, Gay, }  
*Wahlbergella*, Ruppr. near *Lychnis*.  
*Annmodenia*, Gmel. near *Sagina*.  
*Pycnophyllum*, Rémy, near  
*Stellaria*.  
 ? *Glinus*, see p. 526.



Fig. CCCXLI\*.

Fig. CCCXLI\*—1. *Lychnis diurna*, (*Sileneæ*); 2. a flower of *Stellaria media*, (*Alsineæ*); 3. its stamens and pistil; 4. its placenta loaded with seed; 5. a seed cut through vertically to show the embryo curved round mealy albumen.

Malapert and M. Bonnet have shown that *Saponaria officinalis* and *Agrostemma Githago* are poisonous, and ascribe this to their containing saponine. In the last plant the saponine occurs principally in the ripe and immature seed, and also in the roots, but the other parts contain none. *Silene nutans* contains at least as much saponine as *Saponaria*, but here it is diffused throughout the plant, except in the seed; the authors, moreover, found this principle in *Dianthus Caryophyllus*, *caesius*, *carthusianorum*, and *proliferus* (chiefly in the roots, less in the leaves, and not at all in the flowers and seed). *Lychnis dioica*, *chalcædonica*, and *flos cuculi*, *Silene inflata*, and *Cucubalus Behen*, but not in *Arenaria*, *Stellaria*, and *Holostium*.



## Quinn, CLANNIX. H. ELECTROTYPE - 1.5. 1890.

Hogarth, *Out. Hist. Pers.*, 1777; *Illustrations of Dr. Johnson's Lives*, vii (1810); *Illustrations of the Nat. Hist. Man*, 16 p. (1811); *Sketches of Man*, 3 vols. (1813); *The Poems of Thomas Gray*, *Illustrations of Paradise Lost*, 1820; *Lectures on Art*, 1811; *Illustrations of Paradise Lost*, 1820; *Writings*, 2, 42.

DIAGNOSIS.—Salivary *Parotid*, with both *salivary* and *glandular* secretions, in the latter *medullary*, *stroma* and *ducts* and *ducts* and *ducts*.

Herbaceous or half-shrubby branching plants, with opposite or alternate, often fascicled, sessile, entire leaves, and scarious stipules. Flowers terminal, with scarious bracts. Sepals 5, seldom 3 or 4, sometimes distinct, sometimes cohering more or less. Petals minute, inserted upon the calyx between the lobes, occasionally wanting. Stamens exactly opposite the sepals, if equal to them in number, sometimes fewer by abortion, sometimes more numerous; filaments distinct; anthers 2-celled. Ovary 1-celled, rarely 2-celled, with 1 or more ovules, superior; styles 2-5, either distinct or partially combined. Fruit small, dry, 1-celled, rarely 2-celled, either indehiscent or opening with 3 valves. Seeds either numerous, upon a free central placenta, or solitary and pendulous from a funiculus originating in the base of the cavity of the fruit; albumen farinaceous; embryo lying on one side of the albumen, curved more or less, with the radicle always pointing to the hilum; cotyledons small.

Very near Purslanes, Amaranths, and Cloveworts, from which they are distinguished with difficulty. From the latter their scarious stipules will separate them; and there is scarcely any other character that will; for no value seems assignable to a slight tendency to a perigenous insertion of the stamens which is observable in both Orders. From Purslanes they are best known by the position of the stamens before the sepals instead of the petals, and by the number of the sepals. With Houseleeks, particularly Tillæa, they often agree in habit, but their concrete carpels will always distinguish them. According to Cambrésides, the genus Spargularia, in which the petals and stamens are very often perigenous, the styles sometimes consolidated at their base, and the stamens 5 in number, establishes a passage between Cloveworts and Knotworts, and tends to confirm the opinion of those who consider these two Orders as belonging to the same Affinity.

The south of Europe and the north of Africa are the great stations of the *Urtica*, where the species grow in the most barren places, covering with a dense vegetation, which is incapable of bearing anything else. A few are found at the Cape of Good Hope; and North America, including Mexico, comprehends several.

A trace of astringency pervades the Order, and is the only sensibly property that it is shown to possess.

[illegible]

## GENERAL

[illegible]

NOMMIS, GEN. 24. Sp. 1161.

POSITION.—Portulacæa—L. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 852. 853. 854. 855. 856. 857. 858. 859. 860. 861. 862. 863. 864. 865. 866. 867. 868. 869. 870. 871. 872. 873. 874. 875. 876. 877. 878. 879. 880. 881. 882. 883. 884. 885. 886. 887. 888. 889. 890. 891. 892. 893. 894. 895. 896. 897. 898. 899. 900. 901. 902. 903. 904. 905. 906. 907. 908. 909. 910. 911. 912. 913. 914. 915. 916. 917. 918. 919. 920. 921. 922. 923. 924. 925. 926. 927

Fig. CXLII. — *Paronychia capitata*. 1. A section of a flower; 2. of the ovary; 3. Pappus; 4. a section of it. — *N. 100x*.



## ORDER CXC. PORTULACEÆ.—PURSLANES.

Portulacæ, *Juss. Gen.* 313. (1789) in part; *A. St. Hil. Mém. Plac. Cent.* 42. (1815); *DC. Prodr.* 3. 351. (1828); *DC. Mém. de la Soc. d'Hist. Nat. de Paris, Aug.* (1827); *Endl. Gen. cavi.*; *Meisner Gen.* 130.; *Wight Illustr.* 2. 41.

DIAGNOSIS.—*Sileneal Exogens, with the calyx and corolla unsymmetrical  $\frac{2}{2}$ , the latter usually conspicuous, amphotropal ovules, and alternate succulent leaves without stipules.*

Succulent shrubs or herbs. Leaves alternate, seldom opposite, entire, without stipules, often with bundles of hairs in their axils. Flowers axillary or terminal, usually ephemeral, expanding only in bright sunshine, unsymmetrical in their calyx and corolla. Sepals 2, cohering by the base. Petals generally 5, either distinct or cohering in a short tube. Stamens inserted along with the petals irregularly into the base of the calyx or hypogynous, variable in number, all fertile, sometimes opposite the petals; filaments distinct; anthers versatile, with 2 cells, opening lengthwise. Carpels 3 or more, combined into a one-celled ovary, which is usually free (or partially adherent); style single or none; stigmas several, much divided; ovules amphotropal. Capsule 1-celled, dehiscing either transversely or by valves, occasionally 1-seeded and indehiscent. Seeds numerous, if the fruit is dehiscent; attached to a central placenta; albumen farinaceous; embryo curved round the circumference of the albumen, with a long radicle next the hilum.

Ovary partially adherent in some Portulacæ.

In general the Purslanes are easily recognised by their succulent condition and gay ephemeral flowers; but in some the flowers are inconspicuous, and in others the succulence inconsiderable. They, in such cases, would have little to distinguish them from Cloveworts (Caryophyllacæ), except their 2-leaved calyx, and that in truth, combined with the other characters, furnishes the essential mark of the Order. Endlicher, however, extends the limits of the Purslane group much beyond this, admitting a number of perigynous genera whose flowers are quite symmetrical. These are spoken of elsewhere. In his view, the difference between Purslanes and Cloveworts consists mainly in this, that the former have the stamens alternate with the sepals when they are equal to them in number, and the latter opposite under the same circumstances. But in Orders where the number of stamens is sometimes indefinite and sometimes has no sort of relation to the sepals, as is, in fact, the case with the whole Portulacaceous Order as it stands here, it is plain that such a distinction has no existence. I have, therefore, thought it advisable to reject a portion of Endlicher and Fenzl's Purslanes, in which the perigynous insertion is very marked, placing them in the Ficoidall Alliance, while all his hypogynous genera with symmetrical flowers are conveniently arranged among the Cloveworts. The principal deviation from the general features of the Order strictly limited, consists in some species having the ovary partially adherent, and the stamens, therefore, perigynous. Such instances seem to connect the Order with the genera just alluded to. From Knotworts (Illecebraceæ) the monospermous genera of Purslanes are distinguished by the want of symmetry in their flowers, and by the stamens being opposite the petals instead of the sepals. De Candolle remarks, that Purslanes



Fig. CCCXLIII.

Fig. CCCXLIII.—*Portulaca australis*.—Endlicher. 1. a flower; 2. an expanded corolla; 3. a pistil; 4. a ripe fruit; 5. a section of it.







## ORDER CXCI. POLYGONACEÆ.—BUCKWHEATS.

*Polygonaceæ*, Juss. *Gen.* 82. (1789); *R. Brown*, *Prodr.* 418. (1810); *Bentham* in *Linn. Trans.* (1836); *Endl. Gen.* ciii.—*Polygonaceæ*, *Ed. pr.* (1836); *Meisner Gen.* 316.

DIAGNOSIS.—*Sileneal Exogens*, with an orthotropical ovule, and a usually triangular nut.

Herbaceous plants, rarely shrubs. Leaves alternate, their stipules cohering round the stem in the form of an ochrea; when young, rolled backwards, occasionally wanting.



Fig. CCCXLIV.

Flowers occasionally unisexual, often in racemes. Calyx free, often coloured, imbricated in æstivation. Stamens very rarely perigynous, usually definite and inserted in the bottom of the calyx; anthers dehiscing lengthwise. Ovary free, usually formed by the adhesion of 3 carpels, one-celled, with a single erect ovule, whose foramen always points upwards; styles or stigmas as many as the carpels of which the ovary consists; ovule orthotropical. Nut usually triangular, naked, or protected by the calyx. Seed with farinaceous albumen, rarely with scarcely any; embryo inverted, generally on one side, sometimes in the axis; radicle superior, long.

Brown remarks, that "the erect ovulum with a superior radicle together afford the most important mark of distinction between Polygonaceæ and Chenopodiaceæ, a character which obtains even in the genus *Eriogonum*, in which there is no petiolar sheath, and scarcely any albumen, the little that exists being fleshy;" to which may be added, that their orthotropical ovule divides them from all the other Orders of the Sileneal Alliance. Generally speaking, however, the cohesion of the scarious stipules into a sheath, technically called an ochrea, or boot, is sufficient to distinguish Buckwheats from the neighbouring Orders. Their affinity, moreover, does not appear to be so close with Chenopods as with Clove-worts, for they have the very important peculiarity that their ovary is formed by the consolidation of 3 carpellary leaves touching each other in a valvate manner, and thus producing a triangular form in the ripe fruit; and if even this is departed from, yet the ovary is undoubtedly compound and not simple as in Chenopods. Bentham admits two tribes, Polygonaceæ, which have loose flowers and ochreate stipules, and Eriogoneæ which have flowers in involucre and usually no stipules. The latter bring them near Nyctagots.

Fig. CCCXLIV.—*Polygonum lapathifolium*. 1. a flower cut open; 2. a vertical section of the seed; 3. a flower of *P. Convolvuli*; 4. a transverse section of a seed; 5. a diagram of the flower of *Rumex crispus*; 6. a vertical section of its ripe fruit, &c.; 7. its fruit.



There are few parts of the world which do not acknowledge the presence of plants of this Order. In Europe, Africa, North America, and Asia they occupy ditches, hedges, and waste grounds, in the form of Ducks and Pursuants; the fields, mountains, and heaths as Sorrels and trailing or trailing Polygonums; in South America and the West Indies they take the form of Coccolobas or Smashed grapes; in the forest of Rhubarbs; and even in the desolate regions of the North Pole they are found in the shape of Oxyria.

Sorrel on the one hand, and Rhubarb on the other, may be taken as the representatives of the general qualities of this Order. While the leaves and young shoots are cool and agreeable, the roots are universally nauseous and purgative. To these two qualities is to be superadded a third, that of astringency, which is found in a greater or less degree in the whole Order, but which becomes in Coccoloba urens so powerful as to rival gum Kino in its effects. Some of the Polygonums are also acrid, as the *P. Hydro-piper*, which is said to blister the skin, and there is a species of Polygonum, called Cataya in the language of the Brazilian Indians, which has a very bitter peppery taste, an infusion of the ashes of which is used to purify and condense the pulse of the sugar-cane, and is employed on the Rio St. Francisco with advantage in the disease called O Lazo, an enlargement of the colon, caused by debility. Oxalic acid is copiously formed in both Ducks and Rhubarbs; the latter nevertheless contains nitric and malic acids in abundance, and it is those which give an agreeable taste to the stalks of the latter when cooked, but which also render them so insistent to the digestion of some persons. For the facts concerning the qualities and origin of the Rhubarbs in medical use, the reader may consult Royle, Gubourt, Pereira, Gouger, Knuthner, and the *Pharm. Medica*. It seems probable that some at least of the Turkey Rhubarb is *Rheum palmatum*; that *R. undulatum* is also largely collected, and that *R. Emodi* and *Wentianum* furnish the Rhubarb used in the hospitals of India. Coebel positively contradicts the statement made by some writers that Rheum leucorhizum yields a fine sort of Rhubarb; he says that it has an insipid slimy taste, not at all like that of Rhubarb.—Ann. Ch. t. 110. Before this sort of drug was so common, the roots of *Rumex alpinus* were employed in its stead, under the name of Monk's Rhubarb; it is however much less active. The Rheum Ribes, called Riwaseh or Ribas in the East, furnishes the Arabs with an excellent medicine, and its leaf-stalks are used in the preparation of sherbet. Ducks are species of *Rumex*; their prevailing character is astringency, which has given them some celebrity as remedies for diarrhoea, and as stomachics. *R. Patientia* (*Agrimonia eupatoria*), although now expelled from gardens, was once esteemed as a suberbid potherb, and its roots were used as laxatives. Sorrels, whose acidity is chiefly owing to oxalic acid, are all species of this same genus; the most esteemed among them for garden purposes is *R. scutellus*. A legion of species forms the genus Polygonum, celebrated in various ways. Some are used in dyeing, especially *P. tinctorium*, which yields a blue hardly inferior to indigo, and is largely cultivated for it in France and Flanders. Of *P. Hydro-piper* the leaves are so acrid as to act as vesicants; it is reputed to be a powerful diuretic, but to lose its activity by drying, on which account it requires to be used fresh; it will dye wood yellow. *P. Bisorta* is a useful astringent; the decoction may be employed in gonorrhoea and leucorrhoea, as an injection, as a gargle in relaxed sore throat and sprain of gums, and as a lotion to ulcers attended with excessive discharge; internally it has been employed, combined with Gentian, in intermittents; it may also be used in passive hæmorrhages and diarrhoea. Several of the Brazilian Polygonums are said by Martius to be useful as astringents, and to be employed in the treatment of syphilis. The roots of *Fagopyrum esculentum*, or Buckwheat, tataricum, and others, are used as food in the sake of their mealy albumen; those of *P. aviculare* are said to be powerfully emetic and purgative; but this is doubted by Meisner. The seeds of *Polygonum lacustrum* are used as medicine by Hindoo practitioners, to cause the pain of crying to the mother. The leaves of *P. hispidum* are said by Humboldt to be substituted in South America for Tobacco. *Coccoloba uvifera*, remarkable for the succulent watery latex in which its nuts are enveloped, is on that account called the Smashed grapes in the West Indies, and yields an extremely astringent extract; its wood dyes red, its fermented leaves are acid, pleasant, and eatable. The root of *Calligonum Pallasiæ*, a trifoliate herb found in the sandy steppes of Siberia, turns from its roots, when scraped and boiled, a gummy nutritious substance, resembling Tragacanth, on which the Calmucks feed in times of scarcity, while they chew the acid branches and finish the whole with their milk. *Muhlenbeckia adpressa* is stated by Mr. Backhouse to have clusters of succulent fruits of a sweetish taste, which have been made into pies and puddings in the penal settlements of Australia. The trunk and branches of *Triplaris americana* are chambered like those of the Coccoloba, or Trumpet tree, and serve for the habitation of light-brownish ants, which inflict a most painful bite.—Schenck, &c. in Ann. N. H. V. 1838.



## GENERA.

I. ERIOGONEÆ.—*Benth.*

*Pterostegia*, Fisch. et M.  
*Mucronea*, *Benth.*  
*Chorizanthe*, R. Br.  
*Eriogonum*, L. C. Rich.  
*Espinosa*, Lagasc.

II. POLYGONEÆ.—*Benth.*

*Oxyria*, Hill.  
*Donia*, R. Br.  
*Rheum*, Linn.  
*Rhabarbarum*, Tourn.  
*Königia*, L.  
*Polygonum*, L.

*Bistorta*, Tournef.  
*Amblygonon*, Meisn.  
*Lagunea*, Lour.  
*Persicaria*, Tournef.  
*Towara*, Adans.  
*Antenoron*, Rafin.  
*Echinocaulon*, Meisn.  
*Cephalophiton*, Meisn.  
*Didymocephalon*, Meisn.  
*Corymbocephalon*, Mn.  
*Aconogonon*, Meisn.  
*Avicularia*, Meisn.  
*Tiniaria*, Meisn.  
*Fagopyrum*, Tournef.  
*Ampelgynon*, Lindl.

*Oxygonum*, Burch.  
*Calligonum*, L.  
*Polygonoides*, Tournef.  
*Calliphysa*, Fisch. et Mey.  
*Pterococcus*, Pall.  
*Pallasia*, Linn. fil.  
*Coccoloba*, Jacq.  
*Muhlenbeckia*, Meisn.  
*Ceratogonum*, Meisn.  
*Emex*, Neck.  
*Vibio*, Mönch.  
*Centropodium*, Burch.  
*Rumex*, L.  
*Tragopyrum*, Bieb.  
*Gonopyrum*, Fisch.

*Polygonella*, Mx.  
*Lyonia*, Raf.  
*Atraphaxis*, L.

III. TRIPLAREÆ.—*Meyer.*

*Podopterus*, H et B.  
*Rupprechtia*, Meyer.  
*Triplaris*, L.  
*Blochmannia*, Weigelt.  
*Velasquezia*, Bertol.

## IV. BRUNNICHEÆ.—

*Meisn.*  
*Brunnichia*, Banks.  
*Fallopia*, Adans.  
*Antigonon*, Endl.

NUMBERS. GEN. 29. Sp. 490.

*Nyctaginaceæ.*  
*Chenopodiaceæ.*

*Gonopyrum*, Fisch., = *Polygonella*.  
*Thysanella*, A. Gray, near *Polygonum*.  
*Sarcogonum*, Kunze, = *Muhlenbeckia*.

POSITION.—Illecebraceæ.—POLYGONACEÆ.—Caryophyllaceæ.

The position here first given to this family in the Silenale alliance is much confirmed by the observations of Mr. Miers, in a paper read before the Linnean Society in November 1851, upon a plant from the Chilian Andes, belonging to the Eriogoneæ. These remarks are here quoted, as they offer a somewhat novel view of the floral structure of the order, and strengthen my own conclusions. Mr. Benthams, in a monograph of the Eriogoneæ (*Linne. Trans.* xvii. 403), states that he does not agree with Meisner and De Candolle, who inferred the normal number of stamens in Polygonaceæ to be double that of the lobes of the perigonium, and that in all instances, occurring with a less number of stamens, this diminution is alone attributable to the abortion of those parts. Mr. Benthams, on the contrary, showed that such relation is not at all manifest, and he endeavoured to prove that the normal number of floral parts is always ternary, the 6 lobes of the perigonium being biserial, the 9 stamens in 3 series, and the ovary having 3 styles and 3 stigmata: this arrangement, however, is far from general, for the greater number of genera present only 5 floral divisions, with 6, 8, or 9 stamens. Atraphaxis, notwithstanding, offers a binary arrangement of its parts, viz.—4 lobes in the perianthium in 2 rows, with 2 styles, and 2 stigmata. These discrepancies may however be reconciled, according to the views of Mr. Miers, if we pay attention to the following circumstances. There does not seem any apparent reason, why botanists should have constantly regarded the floral envelopes in the Polygonaceæ, as a perigonium or perianthium, words intended to express a confluence of calyx and corolla into one common floral covering, but here the parts constituting the floral envelope are quite distinct, and bear all the usual characters of calyx and corolla. Were this once admitted, and were we to conceive the normal arrangement to be ternary, and to suppose the existence of an occasional binary combination, by the suppression of some of its parts, all the difficulties of its variable structure would be easily explained. In the case where the floral envelopes are only 3 (as in *Königia*), we might look upon it as an apetalous genus: where they consist of 6 lobes, the 3 outer may be regarded as sepals, and the others as petals; or when 9, the 6 interior lobes as a double row of petals. In like manner, when 5 in number, we may conceive the 2 outer lobes (which in such case are always more exterior) to be sepals, and the other 3 to be petals; when 4 or 8, the same distinction may be made, by dividing them into binary series. This hypothesis, though only a modification of Mr. Benthams, will obviously reduce the number of deviations from the normal rule.

These reasons confirm me in the propriety of associating the Polygonaceæ with the Caryophyllaceæ and Portulacaceæ, with which orders they agree in the unsymmetrical inconsistency of their floral parts, in their sepals being often of petaloid texture, in the insertion of their stamens upon a hypogynous ring, quite free from the petals, in their somewhat stipitate ovary, and in their farinaceous albumen enclosing a curved embryo. The Caryophyllaceæ also have their petioles somewhat vaginant.

All the Eriogoneæ hitherto known, and the group is very numerous in species, accord with Mr. Benthams normal rule, having 6 floral segments in 2 series, 9 stamens and 3 styles, but the plant described by Mr. Miers has a quaternary arrangement, and according to his views 4 sepals, 4 petals, imbricately disposed in distinct series, and 8 stamens fixed upon the hypogynous ring, with 4 styles and stigmata.

New genera of the Eriogoneæ. (*Journ. Acad. Nat. Sc. Philad.*, 2nd Series, vol. i.)

*Eucycla*, Nutt.  
*Nemacaulis*, Nutt.

*Oxythea*, Nutt.  
*Tetraraphis*, Miers.  
*Stenogonum*, Nutt.

The root of *Rumex abyssinicus* or *Mokmoko* is much employed in Abyssinia to prevent the rancidity of butter, which is found to undergo no change, and to acquire no bad flavour when this root is macerated in it.—*Ach. Rich.* Dr. Weddell describes an Ant-tree, belonging to this order. The *Triplaris Bonplandiana* is stated by him to be constantly the habitation of a fragrant ant (*Nymica*) which lives in the pith, and communicates with the outside by narrow galleries. This insect is very slender, swarms in hundreds from the interior when the tree is shaken, and inflicts a very severe bite upon the passer by. (*Ann. Sc.*, 3rd Ser., xiii. 263.) He adds that *Rupprechtia*, which some authors refer to *Triplaris*, never contains ants.



## ALLIANCE XXXVIII. CHENOPODALES.—THE CHENOPODAL ALLIANCE.

DIAGNOSIS.—*Hypogynous flowers, with several long-tubed filaments, free central plumule, an external embryo, either curved round or applied to the margin of a little fleshy or leathery albumen, solitary ovules, or if more than one, distinct.*

With these plants, the greater part of which consists of species with mono-petalous flowers, and often with scarcely more floral organs than are absolutely necessary to secure the perpetuation of the race, we have a transition which cannot be mistaken, in the more elaborately constructed Alliances hereafter to be noticed. Nettles and Chenopods are in such strict relationship that we can scarcely say whence the difference consists in certain cases, unless we refer to the internal structure of the seed, and then indeed we find Chenopods with amphitropal ovules, axially albumen, and radicle directed towards the base of the fruit, while Nettles have orthotropal or anatropal ovules, fleshy albumen, and a radicle directed towards the apex of the fruit. Both have stamens opposite the sepals of an inconspicuous petalless calyx, and both have their fruit composed of a single, perfectly simple, carpellary leaf; we even find that in some cases among the Urticid Alliance the circular, or spiral, embryo of Chenopods makes its appearance. (See p. 265).

Even as regards the distinction of the stamens and pistil there is a great similarity between the two races under consideration. For if all the Urticid Alliance consists of plants whose flowers are strictly unisexual ( $\sigma^6$ ), so also does the Chenopodal Alliance contain a great many species which are similarly constituted, notwithstanding that the tendency of the structure is towards a combination of the sexes ( $\sigma^6$ ). It is, in fact, among the Chenopodal Alliance that we find most exceptions to the distinctions between diclinous and bisexual organisation; as might be expected, where Orders run so much together otherwise.

From the Silenid Alliance this is known by the absolute simplicity of the ovary, and by no other positive mark: there may be several ovaries present in the same flower, but they are then distinct from each other. It is, however, to be remembered that Chenopodals have, in no case whatever, a corolla, while in a large part of the Silenids, petals are obviously present. Nyctagos, a portion of this Alliance, runs as if they were attempting to emulate the Silenids; for, although they have only a calyx, yet that calyx does, in many instances, assume altogether the ordinary colour and texture of a corolla.

## NATURAL ORDERS OF CHENOPODALES.

<i>Sepals united into a long, often adnately phallic tube, which separates from its base, the latter becoming hard, and forming a spurious pericarp.</i>	192. NYCTAGONACEÆ.
<i>Sepals separate, flat. Stamens alternate with the sepals or no. Carpels several (or 1).</i>	193. FICOCARPOIDEÆ.
<i>Sepals separate or nearly so, flat. Stamens opposite the sepals. Anthers often 1-celled. Ovary 1, often unilocular. (Plumule scarious, surrounded by indurated bract).</i>	194. ACHILLOIDEÆ.
<i>Sepals separate, or nearly so, flat. Stamens opposite the sepals. Anthers 2-celled. Ovary 1, always unilocular. (Plumule herbaceous, naked).</i>	195. CHENOPODIACEÆ.



## ORDER CXII. NYCTAGINACEÆ.—NYCTAGOS.

Nyctagines, *Juss. Gen.* 90. (1789) ; *R. Brown Prodr.* 421. (1810) ; *Bartl. Ord. Nat.* 109 ; *Endl. Gen. civ.* ; *Meisner*, p. 318.

DIAGNOSIS.—*Chenopodal Exogens*, with a tubular often coloured calyx, which separates from its base, the latter becoming a hard spurious pericarp.

Annuals or perennials, often with fleshy roots, or shrubs or trees, usually articulated at the tumid nodes. [The vascular system double; the central consisting of bundles scattered among the pith, the circumferential of bundles not adhering to each other.—*Unger.*] Leaves opposite, and almost always unequal; sometimes alternate. Flowers axillary or terminal, clustered or solitary, sometimes imperfect, having an involucre which is either common or proper, in one piece or in several pieces, sometimes minute, but more generally very large, and sometimes gaily coloured. Calyx tubular, somewhat coloured, contracted in the middle; its limb entire or toothed, plaited in æstivation, becoming indurated at the base, and losing the limb which is deciduous. Stamens definite, hypogynous, sometimes on one side; anthers 2-celled. Ovary superior, with a single erect ovule, whose foramen is inferior; style 1, terminal or somewhat lateral; stigma 1. Fruit a thin utricle, inclosed within the enlarged persistent base of the calyx. Seed without its proper integuments, its testa being coherent with the utricle; embryo with foliaceous cotyledons, wrapping round floury albumen; radicle inferior; plumule inconspicuous.

Here we have a race of plants, of which the common Marvel of Peru is the type, whose affinity is clearly with the Chenopods and Amaranths, from which it is distinguished by the curious property of converting the base of its thin membranous tubular calyx into a tough or bony shell which acts as a pericarp to the seed, whose real pericarp is but a membrane. Moreover, the tubular calyx, the limb of which is plaited in æstivation, together with the curved embryo and farinaceous albumen, at all times distinguish Nyctagos; add to which, the articulations of the stem are often tumid, as in Cranesbills. Schleiden states (*Wiegman's Arch.* 1839), that the wood figured at t. 42,

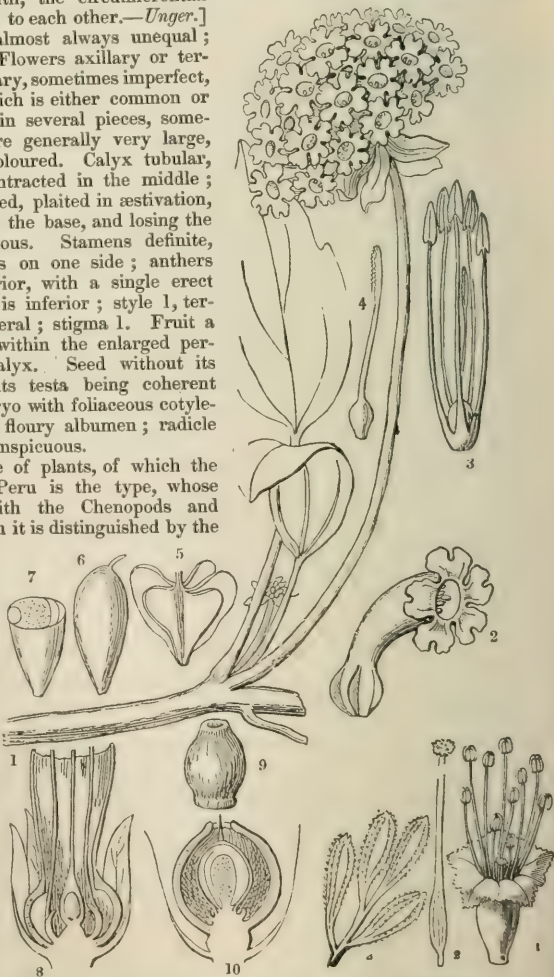


Fig. CCCXLV.

Fig. CCCXLVI.

Fig. CCCXLV.—1. *Abronia mellifera*; 2. a flower separate; 3. its stamens and pistil; 4. the pistil separate; 5. the fruit; 6. seed magnified; 7. a cross section of it; 8. the lower portion of the flower of *Mirabilis Jalapa*; 9. its fruit; 10. a perpendicular section of it.

Fig. CCCXLVI.—*Pisonia grandis*. 1. a flower; 2. a pistil; 3. a cluster of fruits.







## ORDER CXCI. PHYTOLACCACEÆ.—PHYTOLACCADS.

Phytolaccæ, R. Brown in Congo, 454. (1818); Bartl. Ord. Nat. p. 299. (1830); Meisner Gen. 322.—Phytolaccæ, Ed. Pr. clviii.; Endl. Gen. ccviii.—Rivina, Agh. Martius Conspectus, No. 91. (1835).

DIAGNOSIS.—*Chenopodal Exogens, with separate flat sepals, stamens either 00 or alternate with the sepals, and one or several carpels.*

Under-shrubs or herbaceous plants. Leaves alternate, entire, without stipules, often with pellucid dots. Flowers racemose, perfect, regular, or somewhat irregular, very variously arranged. Calyx of 4, or 5, imbricated leaves, which sometimes assume altogether the appearance of distinct petals. Stamens hypogynous or nearly so, either indefinite, or if equal to the number of the divisions of the calyx alternate with them; anthers 2-celled, opening lengthwise. Carpels solitary, or several, distinct or but partially combined, each containing 1 ascending ovule, which is either amphitropal or campylotropal; styles and stigmas equal in number to the carpels. Fruit baccate or dry, indehiscent. Seeds ascending, solitary, with a cylindrical embryo curved round mealy albumen, the radicle being next the hilum.

The small cluster of genera called Phytolaccads, forms an Order nearly related to Chenopods and Buckwheats, from the first of which it is distinguished by the numerous carpels and the stamens exceeding the number of divisions of the calyx, or being alternate with them; or if the carpel is solitary, by the calyx being petaloid, a circumstance which never occurs in Chenopods. From Buckwheats it is known by the radicle being turned towards the hilum, the want of stipules, and the perfect simplicity of the ovaries. Rivina, which has the albumen very much reduced in quantity, brings into the same neighbourhood Phytolaccads and Petiveriads. Brown remarks that these two Orders, widely as they differ in the structure of the pistil, are connected by a species of Phytolacca related to *P. abyssinica*, in which the 5 cells are so deeply divided that they merely cohere by their inner angles; and also by *Gisekia*, which has 5 distinct ovaries. Endlicher unites to this Order both Petiveriads and Gyrostemons, both of which will be found elsewhere in this work. The numerous free carpels seem to point out some kind of relation to the Ranal, and their verticillate arrangement to the Malval Alliæ.

Many are natives of either America, within or without the tropics; others of Africa and India. *Phytolacca decandra* is naturalised in some of the southern parts of Europe.

The species are generally acrid, but that property is inconsiderable in some, and is dispersed by heat in others. A tincture of the ripe berries of *Phytolacca decandra*, or *Pocan*, seems to have acquired a well-founded reputation as a remedy for chronic

and syphilitic rheumatism, and for allaying syphilitic pains. By some it is said to be more valuable than Guaiacum. It has had no inconsiderable celebrity as a remedy for cancer, but is no longer esteemed, and it is probable that it was only found serviceable in ill-conditioned sluggish ulcers, which are too frequently mistaken for real cancer. Its pulverised root is an emetic. A spirit distilled from the berries is stated to have killed a dog in a few minutes. According to De Candolle, the plant is also a purgative; but it acts so violently, and is accompanied by such ambiguous narcotic symptoms, as not to be at all calculated for internal use. Bigelow says that externally applied it causes heat and smarting; he found it useful in psora and tænia capitis. The leaves are extremely acrid, but the young shoots, which lose this quality by boiling in water, are eaten in the United States as Asparagus, and Dr. Royle tells us that *Phytolacca*



Fig. CCCXLVII.

Fig. CCCXLVII.—*Phytolacca decandra*. 1. its flower; 2. its stamens and pistil; 3. a section of a seed.



acinoso is also so employed in the Himalayas. *P. Arvensis*, a Chinese plant, with a turnip-shaped root, is said to have a most violent action by its stimulant. Boiling of the Rhiza yield a rich red dye.

The following is M. Moquin Tandon's arrangement in *De Combust. Pharm. Art.* part 2, p. 4. He considers them somewhat allied to *Basellaceæ* and *Assurineæ* by the three close or distant bracts, coloured calyx and seeds. He refers *Sagittaria* here, notwithstanding its want of albumen, and straight or curved embryo, regarding it as an approach to *Malvaceæ*. And *Crotonium* by reason of its central vascular in the centre of verticillate carapæ, points, he thinks, in the same direction.

# GENERA.

I. PERIVERBERA.	II. PHYTOLACTACEÆ.	III. GYMNAMNEM.
<i>Sagittaria</i> , Linn.	<i>Morisonia</i> , Sw.	<i>Sagittaria</i> , Linn.
<i>Quercus</i> , Guss.	<i>Sagittaria</i> , Linn.	<i>Quercus</i> , Linn.
<i>Polypodium</i> , Linn.	<i>Polypodium</i> , Linn.	<i>Polypodium</i> , Linn.
<i>Rorippa</i> , Pers.	<i>Rorippa</i> , Pers.	<i>Rorippa</i> , Pers.
<i>Linum</i> , Miller.	<i>Linum</i> , Miller.	<i>Linum</i> , Miller.
<i>Isotriaena</i> , Kuhn.	<i>Isotriaena</i> , Kuhn.	<i>Isotriaena</i> , Kuhn.
<i>Morisonia</i> , Moq.	<i>Morisonia</i> , Moq.	<i>Morisonia</i> , Moq.
<i>Hesperis</i> , Fl. Flamm.	<i>Hesperis</i> , Fl. Flamm.	<i>Hesperis</i> , Fl. Flamm.
<i>Morisonia</i> , Kuhn.	<i>Morisonia</i> , Kuhn.	<i>Morisonia</i> , Kuhn.

NUMBERS. GEN. 2. Sp. 77.

POSITION. ————— *Polypodium*.  
*PHYTOLACTACEÆ*. *Chenopodiaceæ*.  
*Polypodium*.  
*Morisonia*?

**SURIACEÆ.** (*Wight and Annett, Papers*, 1. 1840. *Ed. pr.*) is the name given to a supposed Order of plants represented by a solitary species, *Suriaceæ* (partita) found on the coast of all tropical countries. In the last edition of this work it is thus described. — A woody plant with alternate leaves without stipules. Hairs capitate, thick, alternate. Flowers racemose, ♂. Calyx 2 parted, slightly imbricate. Petals the like number, equal, shortly oblong. Stamens indefinite, hypogynous, placed in a single row; anthers subulate; anthers reniform, individual, bearing intercalary by two longitudinal fissures. Carpels 2, distinct, attached to a very short apophysis. 2-celled with 2 ascending longitudinal cavities; styles rising from near the base of the carpels; stigmas simple. Pericarp woody. Seed solitary, oval, compressed. Embryo angular, without albumen, terete, with the cotyledons about the same length as the radicle when it turned to the left. — This is one of those obscure forms, whose relationship can hardly be traced satisfactorily with some allied genus shall have been discovered; for it seems improbable that the genera *Heterandria* and *Crotonium*, with which it has been associated, should have any real affinity. It, some respects it may be compared with *Crotonium* and *Crotonium*, but its distinctness is so prominent as to indicate a somewhat different relationship, and one, indeed, has led Dr. Wight (*Papers*, 2. 4. 1) to suggest an affinity to *Phytolactaceæ*, especially to the genus *Gymna*. — Which corresponds accurately in the character of the ovary and fruit, and even of the seed. — The presence of petals in *Suriaceæ*, he considers unimportant, in which I agree with him. A more grave objection lies in the position of the stamens, which, in *Phytolactaceæ*, are alternate with the sepals; but in *Suriaceæ*, according to Mr. Annett, they are opposite to them, upon this *Crotonium* confirms. The accompanying figure (Fig. CCXLVIII) is from *Wight and Annett's Papers* (p. 1840), and is here given to assist Botanists in comparing the genus *Suriaceæ* with the genus *Phytolactaceæ*. — Dr. Wight, by the way, would have the genus *Rigotia* as a third [sic] genus *Suriaceæ*, containing *Crotonium* and *Crotonium*.



FIG. CCXLVIII.

# GENERA.

SURIACEÆ.

1.

*Sagittaria*, Linn.

Fig. CCXLVIII. — *Suriaceæ* (partita). 1. a flower; 2. a fruit (seed); 3. a section of a fruit; 4. a section of a fruit; 5. a seed (seed-vessel).



## ORDER CXCIV. AMARANTACEÆ.—AMARANTHS.

*Amaranthi*, Juss. Gen. 87. (1789).—Amarantaceæ, R. Brown, Prodr. 413. (1810); Von Martius Monogr. (1826); Endl. Gen. cii.; Meisn. Gen. 316.—Polycnemeæ, Moq. Tand. in Ann. Sc. n. s. 7. 41.

DIAGNOSIS.—*Chenopodal Exogens*, with separate sepals opposite the stamens, usually one-celled anthers, a single ovary often containing several seeds, and scarious flowers buried in imbricated bracts.

Herbs or shrubs. Leaves simple, opposite or alternate, without stipules. Flowers in heads or spikes, usually coloured, occasionally unisexual, generally hermaphrodite. Pubescence simple, the hairs divided by internal partitions. Sepals 3 or 5, hypogynous, scarious, persistent, herbaceous or coloured, distinct or united at the base, all equal, sometimes with 3 more interior than the others, the back one being sometimes dissimilar, occasionally with 2 bractlets at the base, and generally immersed in dry coloured bracts. Stamens hypogynous, either 5 opposite the sepals, or some multiple of that number, either distinct or monadelphous, occasionally partly abortive; anthers either 2-celled or 1-celled. Ovary single, free, 1- or few-seeded; the ovules amphitropal, hanging from a free central funiculus; style 1 or none; stigma simple or compound. Fruit a membranous utricle, sometimes a caryopsis or berry. Seeds lentiform, pendulous; testa crustaceous; albumen central, farinaceous; embryo curved round the circumference; radicle next the hilum.

Distinct as this Order appears to be from Chenopods in habit, especially if we compare such a genus as Gomphrena with Chenopodium itself, yet it is so difficult to define the differences which distinguish the two Orders, that, beyond habit, nothing certain can be pointed out. Brown remarks (*Prodr.* 413.) that he has not been able to ascertain any absolute diagnosis to distinguish them by; for the hypogynous insertion attributed to their stamens is not only not constant in the Order, but is also found in Chenopods. Martius, in a learned dissertation upon the Order, describes Chenopods as being apetalous, and Amarantths as polypetalous, considering the bractlets of these latter as a calyx, and that which I call a calyx a corolla. But it seems to me that this view of their structure is not borne out by analogy, and that it is impossible to believe the floral envelopes of the two Orders to be of a different nature. Endlicher observes that, although no single character divides them, yet they may be known by several characters taken together: thus Gomphreneæ have one-celled anthers, and Celoseæ many seeds; of the remainder, which are most like Chenopods, some differ from Salicorniids in the stem not being jointed, others from Atriplicids in the ♂ and ♀ flowers not being different. Bartling combines the whole in a single class, along with Caryophyllæ, Phytolaccæ, Scleranthæ, and Illecebræ; and there is no doubt of the affinity borne to each other by all these, as is pointed out by their habit and by the structure of their seeds. Illecebræ are in fact only known by their petals, compound ovary, and great membranous stipules. It has been stated by Schleiden that the singular mixed wood of Phytolaccæ and some Chenopods also occurs in *Amaranthus viridis*. I do not, however, find it in the woody species, such as *Deeringia celosioides*, *Cometes abyssinica*, and *Desmochæta flavescens*; but some tendency towards it seems to exist in *Achyranthes arborescens*. The point requires to be carefully investigated. Schultz describes the wood as being something between *Peperomia* and *Piper*. He says that the axis of *Amaranthus* contains very numerous fibrovascular bundles, but *Achyranthes* only 1 or 2.

Amarantths grow in crowds or singly, either in dry, stony, barren stations, or among thickets upon the borders of woods, or a few even in salt marshes. They are much more frequent within the tropics than beyond them, and are unknown in the coldest regions of the world. Of those known to Martius 53 are found in tropical Asia, 105 in

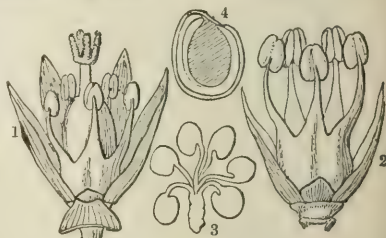


Fig. CCCXLIX.

Fig. CCCXLIX.—*Celosia longifolia*. 1. a flower; 2. the stamens; 3. the ovules; 4. a section of the seed







## ORDER CXCV. CHENOPODIACEÆ.—CHENOPODS.

*Atriplices*, Juss. Gen. 83. (1789).—*Chenopodeæ*, Vent. Tabl. 2. 253. (1799); *R. Brown Prodr.* 405. (1810); *C. A. Meyer in Led. Fl. Alt.* 1. 370. (1829); *Moquin Tandon in Ann. Sc. Nov. Ser.* 1. 203. (1834); *Endl. Gen. ci.*; *Moq. Tand. Monogr.* (1840).—*Chenopodiaceæ*, Ed. pr. clvi.; *Meisn.* p. 319.—*Corispermæ*, *Moq. Tand.*—*Cynocrambeæ*, *Th. N. ab E. Gen. Pl. Europ.* (1835).

DIAGNOSIS.—*Chenopodal Exogens*, with separate flat sepals opposite the stamens, 2-celled anthers, a single one-seeded ovary, and herbaceous naked flowers.

Herbaceous plants or under-shrubs, sometimes jointed. Leaves alternate without stipules, occasionally opposite. Flowers small, ♂, sometimes ♂-♀-♀, frequently ♂ ♀.

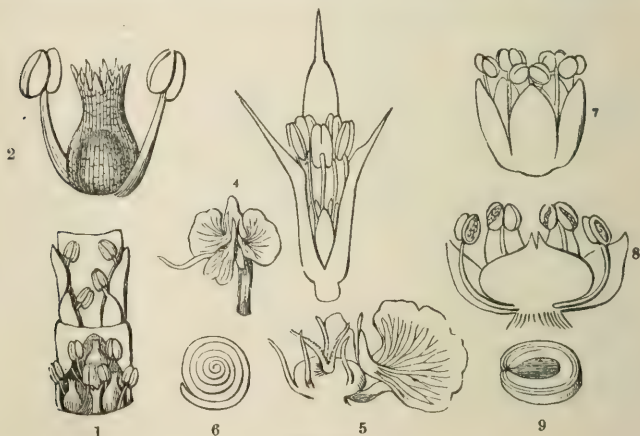


Fig. CCCL.

Calyx deeply divided, sometimes a little tubular at the base, persistent, with an imbricated æstivation. Stamens inserted into the base of the calyx, opposite its segments, and equal to them in number, or fewer. Ovary single, superior, or occasionally adhering to the tube of the calyx, with a single amphitropal ovule attached to the base of the cavity; style in 2 or 4 divisions, rarely simple; stigmas undivided. Fruit membranous, not valvular, sometimes baccate. Embryo annular or horseshoe-shaped, surrounding the albumen (*Cyclolobææ*); or in a flat spiral, separating 2 masses of albumen; or conically spiral without albumen (*Spirolobææ*), with the radicle in various directions as regards the fruit, but always turned to the hilum.

In this Order we have a crowd of species consisting partly of unisexual, and partly bisexual plants, corresponding so much in general structure otherwise, that Botanists seem to have no disposition at present to divide them. But as they are also provided with exceedingly different seeds, there is small probability of the integrity of the Order being long preserved. Till, however, they shall have been studied with reference to their woody structure, a separation would be premature; in that respect they differ considerably.

Schleiden first remarked that certain plants of this Order, namely, *Beta Cycla*, *Atriplex hortensis*, and *Chenopodium Quinoa*, have the wood very compact and pierced with vertical cords of cellular tissue (see *NYCTAGINACEÆ*). But I do not find this structure

Fig. CCCL.—1. a portion of the spike of *Salicornia herbacea*, with the flowers lodged in the notches of the axis; 2. a flower separate; 3. a flower of *Salsola Kali*; 4. its ripe fruit; 5. the same magnified, with a portion of the leafy dilated calyx torn away; 6. its embryo; 7. a flower of *Chenopodium album*; 8. a section of the same, showing the superior ovary; 9. its seed cut through to show the embryo.



uniform in such woolly species as I have examined. It exists, for instance, in *Halogeton* and *strobilaceum*, *Rhagocha* *Billardieri*, *Olema* *portulacoides*, *Portia* *occidentalis*; but does not appear in *Campylosoma* *monspeliaca*, and some *Salicornias*, which are densely zoned; while *Arthrocnemum* *Arbuscula*, *Salsola* *trudacana*, *Salicornia* *sepioides* appear to have a kind of intermediate structure. They all, however, deserve the most careful investigation.

Among other peculiarities, some of the species have a tendency to extend their calyx into horizontal wings, which give them a very peculiar aspect; others secrete a coloured juice abundantly in the sepals, which, growing together in masses, cause an appearance similar to that of the Strawberry. They are distinguished from *Phytolaccæ*, independently of the simplicity of the structure of their ovary, by their stamens never exceeding the number of the segments of the calyx, to which they are opposite; in *Phytolaccæ*, if they are not more numerous than the segments of the calyx, they are alternate with them. It is evident, however, that *Nettles* are not their allies stand in the first degree of relationship; and if it were not for the general tendency of this Order to form bisexual flowers, together with the nearly albumen and interior radicle, it might be doubted whether the *Chenopods* ought not to be even referred to the Urtical Alliance. They seem, however, to belong to the series of bisexual hypogynous Orders, at the same time approaching in some parts of their territory to these polygynous plants which are stationed with *Scleranthus* in *Ficoidales*.

Weeds, inhabiting waste places in all parts of the world, but unlike *Amaranthus*, abounding least within the tropics, and most in extra-tropical regions. They are exceedingly common in all the northern parts of Europe and Asia, and are frequent inhabitants of salt marshes.

Some are used as potherbs, as Spinage, English Mercury (*Chenopodium* *Bonans* *Henricus*), Garden Orach (*Atriplex* *hortensis*), and Chard Beet; the roots of others form valuable articles of food, as Beet and Mangold Wurzel, plants now famous as a new source of sugar, capable of being produced in northern countries. Some of them possess an essential oil, which renders them tonic and antispasmodic; such are *Ambrina* *anthracoides* and *Botrys*; the former has an aromatic sub-acrid taste, and is regarded in Brazil as a carminative, diaphoretic, and emmenagogue; it is prescribed in amenorrhœa, and for the expulsion of the dead fetus.—*Med. uses.* *Chenopodium* *Quinca* is a common article of food in Peru. Soda is yielded in immense quantities by *Salsolas*, *Salicornias*, and others. The essential oil of *Ambrina* *anthelmintica*, known in North America under the name of Worm-seed Oil, is powerfully anthelmintic. The same quality has been observed in *Halogeton* *tamariscifolium*, a Spanish species, called Spanish Worm-seed. *Chenopodium* *vulvaria* or *olidum*, a plant with an atrocious odour, has great reputation as an antispasmodic and emmenagogue. *Thelygonum* *Cynocrambe* (*veronicastrum* *Poir.*) is a sub-acrid plant, abounding in acicular saline crystals, and is slightly purgative. It is sometimes used as a potherb. The seeds of *Atriplex* *hortensis* are said to be so powerful, as to excite vomiting.

# GENERA

<i>Salsola</i> , <i>Thunberg</i>	<i>Spinacia</i> , <i>Thunberg</i>	<i>Trichomanes</i> , <i>Flind. et M.</i>	<i>Salsola</i> , <i>Flind.</i>
<i>Atriplex</i> , <i>C. A. M.</i>	<i>Excoecaria</i> , <i>M.</i>	<i>Chenopodium</i> , <i>Thunberg</i>	<i>Portia</i> , <i>Flind.</i>
<i>Halogeton</i> , <i>B. et A.</i>	<i>Campylosoma</i> , <i>Lam.</i>	<i>Leptochloa</i> , <i>M.</i>	<i>Chenopodium</i> , <i>Lam.</i>
<i>Arthrocnemum</i> , <i>M.</i>	<i>Chenopodium</i> , <i>M.</i>	<i>Portia</i> , <i>Allion.</i>	<i>Salsola</i> , <i>C. A. M.</i>
<i>Ceratophyllum</i> , <i>Boeckl.</i>	<i>Kirilovia</i> , <i>B.</i>	<i>Kochia</i> , <i>R. Br.</i>	<i>Ambrina</i> , <i>P.</i>
<i>Portia</i> , <i>Adans.</i>	<i>Portia</i> , <i>Flind. et M.</i>	<i>Salsola</i> , <i>Recht.</i>	<i>Portia</i> , <i>Flind.</i>
<i>Portia</i> , <i>Schreb.</i>	<i>Portia</i> , <i>Flind. et M.</i>	<i>Kochia</i> , <i>Recht.</i>	<i>Salsola</i> , <i>L.</i>
<i>Chenopodium</i> , <i>Pers.</i>	<i>Salsola</i> , <i>R. Br.</i>	<i>Widdowson</i> , <i>R. Br.</i>	<i>Chenopodium</i> , <i>Thunberg</i>
<i>Chenopodium</i> , <i>Neck.</i>	<i>Ambrina</i> , <i>R. Br.</i>	<i>Maritima</i> , <i>M.</i>	<i>Portia</i> , <i>Flind.</i>
<i>Kirschschmittia</i> , <i>Neck.</i>	<i>Kochia</i> , <i>M.</i>	<i>Chenopodium</i> , <i>M.</i>	<i>Halogeton</i> , <i>C. A. M.</i>
<i>Gibbula</i> , <i>Neck.</i>	<i>Portia</i> , <i>R. Br.</i>	<i>Chenopodium</i> , <i>M.</i>	<i>Halogeton</i> , <i>C. A. M.</i>
<i>Thelygonum</i> , <i>L.</i>	<i>Thelygonum</i> , <i>P. B.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Atriplex</i> , <i>L.</i>	<i>Editha</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Salsola</i> , <i>C. A. M.</i>	<i>Ambrina</i> , <i>S.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Olema</i> , <i>G.</i>	<i>Arthrocnemum</i> , <i>M.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Halogeton</i> , <i>W.</i>	<i>Orthoporus</i> , <i>R. Br.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Gavva</i> , <i>H. et A.</i>	<i>Portia</i> , <i>M.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Atriplex</i> , <i>Linn.</i>	<i>Arthrocnemum</i> , <i>S.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Portia</i> , <i>Flind. et M.</i>	<i>Portia</i> , <i>P.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Portia</i> , <i>Flind. et M.</i>	<i>Portia</i> , <i>P.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>
<i>Portia</i> , <i>Flind. et M.</i>	<i>Portia</i> , <i>P.</i>	<i>Chenopodium</i> , <i>L.</i>	<i>Chenopodium</i> , <i>L.</i>

M. Moquin Tandon has once more arranged this Order in the *Canadiana* *Prodr.* Vol. XIII, part 2, with the following

## ADDITIONAL GENERA

<i>Atriplex</i> , <i>Nuttall</i>	<i>Chenopodium</i> , <i>Boeckl.</i>	<i>Portia</i> , <i>L.</i>	<i>Widdowson</i> , <i>M.</i>
<i>Chenopodium</i> , <i>Nuttall</i>	<i>Portia</i> , <i>M.</i>	<i>Chenopodium</i> , <i>Flind.</i>	<i>Chenopodium</i> , <i>M.</i>



Sevada, <i>Moq.</i>	Pterocalyx, <i>Schrenk.</i> =	Ofaiston, <i>Raf.</i>	Missed by Moquin. Haloxylon, <i>Bunge.</i> Arthrophyton, <i>Schrenk.</i> Girgensohnia, <i>Bunge.</i>
Chenopodina, <i>Moq.</i>	Alexandra.	Halanthium, <i>Koch.</i>	
Brezia, <i>Moq.</i>	Helicilla, <i>Moq.</i>	Noaea, <i>Moq.</i>	
Calvelia, <i>Moq.</i>	Halocharis, <i>Moq.</i>	_____	
Belowia, <i>Moq.</i>	Physogeton, <i>Spach.</i>		

NUMBERS. GEN. 72. Sp. 510.

*Urticaceæ.*

POSITION.—Amarantaceæ.—CHENOPODIACEÆ.—Phytolaccaceæ.

*Scleranthaceæ.*

*Mesembryaceæ?*

M. Moquin regards *Thelygonum* as being nearer Nettles.

### ALLIANCE XXXIX. *PIPERALES*.—THE PIPERAL ALLIANCE.

DIAGNOSIS.—*Hypogynous Exogens, with achlamydeous flowers, and a minute embryo, at or near the outside of a large quantity of mealy albumen.*

The resemblance to each other of the plants included in this Alliance is manifest; but their affinity to Chenopodals is obscure. It chiefly depends upon the assumption that Piperals stand in near relation to Urticals, and that Chenopodals are the bisexual analogue of the latter. Granting this, which seems to be supported by strong evidence, we must then suppose that Piperals are a lateral sprout from Chenopodals, directing itself, not onwards to the next Alliance, but backwards towards the frontiers of the Diclinoous Sub-class, to which the occasional unisexuality of the flowers of Pepperworts and Chloranths evidently points.

Piperals are clearly indicated by their naked flowers, constantly orthotropical ovule, abundant mealy albumen, and minute embryo, which is either external, or only just within the surface of it.

#### NATURAL ORDERS OF PIPERALS.

Carpel solitary. Ovule erect. Embryo lying in vitellus. Leaves opposite or alternate, with or without stipules . . . . .	} 196. PIPERACEÆ.
Carpel solitary. Ovule suspended. Embryo naked. Leaves opposite, with intermediate stipules . . . . .	
Carpels several, distinct. Ovule erect. Embryo lying in vitellus. Leaves alternate, with stipules. . . . .	} 197. CHLORANTHACEÆ.
	} 198. SAURURACEÆ.



## ORDER CXCVI. PIPERACEÆ.—Piperaceæ.

*Piperaceae*, *Rothia* in *Humboldt*, *Reise in Kolumbien*, N. Amer. Ges. IV, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 8

**DIAGNOSIS.**—*Pycnosal Lamnæ*, with a solitary dorsal, an anal fin, no caudal lobe; rays on vertebrae, and opposite or alternate lateral, with or without adipose.

Shrubs or herbaceous plants. Stems articulated. Leaves opposite, verticillate, or alternate in consequence of the abortion of one of the pair of leaves; stipules small or



Fig. 10.11

pairs, or single and opposite the leaf. Flowers usually sessile, sometimes pedicellate, in spikes which are either terminal, or axillary, or opposite the leaves, naked,  $\frac{1}{2}$ , with a bract on the outside. Stamens 2 or more, arranged on one side or all round the ovary; anthers 1- or 2-celled, with or without a fleshy connective; pollen roundish, smooth. Ovary free, simple, 1-celled, containing a single erect, orthotropical ovule; stigma sessile, simple, rather oblique. Fruit free, somewhat fleshy, indehiscent, 1-celled, 1-seeded. Seed erect, with the embryo lying in a fleshy sac placed at the apex of the seed, on the outside of the albumen.

However distinct the exogenous and endogenous forms of vegetation may be in the majority of the plants referred to those classes, it is well known that in certain cases such differences are much entangled. Of this Pepperworts are an instance. According to Richard, they are monocotyledonous ; an opinion in which Blume concurs, after an examination of abundance of species in their native places of growth. But if the medullary rays constitute the great anatomical difference between those divisions of the vegetable kingdom (and I know of no other which is abundant), then Pepperworts are surely dicotyledonous, as is shown by Meyer (*Charaktere der Pflanzenwelt*), and as may be ascertained by any one who will look at an old stem of a Pepperwort, and to this, the veins of the leaves, their distinct articulation with the stem, and the shape of the



3 THE PARTIALS 4

Fig. CCCLL.—*Serrenia Jabonifera*. 1, a cluster of flowers; 2, a typical fruit; 3, a vertical section of the same, showing the seed and position of the embryo.

Fig. 6. C. 1111. *Peperomia blanda*. 1. A bud, showing the ovary and its appendages; 2. A flower seen from the back, showing the ovary and its appendages; 3. A section of the ovary, showing the ovule and its funiculus; 4. A young embryo growing in the ovule.



embryo, and it seems impossible to doubt their being properly stationed among Dicotyledons. In *Peperomia incana*, the young stems are undoubtedly endogenous in appearance, but in *P. nigrum* and *Lonchitis* they are as certainly exogenous, and it is probable that in the former case the wood eventually arranges itself in rows. It has, however, been remarked by Blume, that the oldest spiral vessels, and those which have acquired a woody consistence, occupy the circumference of the stem, while those more recently formed are seated towards its centre; and this is a point which, as Mr. Bennett has observed, requires a careful examination.—*Horsfield's Pl. Jav.* p. 78. Pepperworts are related to Buckwheats, Saururads, and Nettles; from all which, however, they are



Fig. CCCLIII.

distinguished by obvious characters; but more especially to *Chloranthus*, from which they differ in the ovule being erect, and in the presence of a vitellus or amniotic sac round the embryo. In the opinion of those who believe Peppers to be Monocotyledons, their station is near Arads, with which, indeed, they must be considered in any point of view to be in some measure connected.

Exclusively confined to the hottest parts of the world, they are extremely common in tropical America and the Indian Archipelago, but, according to Brown, are very

rare in equinoctial Africa. Only three species have been found on the west coast; several exist at the Cape of Good Hope. They delight in low places, valleys, and the banks of rivers.



These plants are for the most part pungent aromatics, a property which they derive from the presence of a peculiar acrid resin, an ethereal oil, and a crystalline matter called Piperine. But they are also astringents and narcotics, and sometimes are so in



an eminent degree.

Great numbers of species occur in India as aromatics. That which is most extensively employed is

*Piper nigrum*, whose drupes, when dried with the flesh upon them, form both the Black Pepper of the shops, and White Pepper, when that flesh is removed by washing. Although principally employed as a condiment, in order to excite the stomach and promote digestion, Pepper is also extensively employed to medicine in the form of an ointment mixed with lard, against those eruptions, relaxed uvula, and paralysis of the tongue; an infusion in spirit and water of it is a popular remedy against the return of a paroxysm of intermittent fever. It has been recommended by the Indians for this purpose, and is said to be more potent and speedy, and also rubber in its operation than the

Fig. CCLIV.

*Cinchona alkalies.* See Pereira in *Med. res.* xx. 149. In excessive doses, Pepper is a dangerous stimulant. The fruit of *Piper trimum* is said to be still more pungent. The female spikes of *Chavica Roxburghii* (*Piper longum*), dried, form the long pepper of the shops. The root and thickest part of the stems cut into small slices and dried, are much consumed for medical purposes in India under the name of *Pippala Musta*. The



effects of Long Pepper are analogous to those of Black Pepper; some consider it less powerful, others are agreed in its being the more acrid of the two. *Chavica Chaba*, *pepuloides*, and *sylvatica*, are employed in India as substitutes for this sort of Pepper. In tropical America similar uses are made of *Chavica officinarum* (P. Amalago), *Artanthe adunca*, *Peltobryon longifolium*, *Artanthe trichostachya*, and *crocata*. The aromatic roots of many species are officinal in some countries. A decoction of *Artanthe eucalyptifolia* is used in Brazil as a cure for colic, pains in the limbs, and flatulence. The root of *P. Parthenium* is administered in Brazil, under the name of *Paribaroba*, in amenorrhœa, leucorrhœa, and excessive menstrual discharges; that of *Serronia Jaborandi*, and *Enckea unguiculata* and *glaucescens* is held to be sialagogue and diuretic, and is employed for similar purposes. *Pothomorpha sidaefolia* (or *umbellata*) and *subpeltata* are also said to act as powerful stimulants of the lymphatic system, as deobstruents of some energy, and also for cleansing foul ulcers.—*Martius*.

Another class of remedial agents consists of those Pepperworts which possess the power of allaying inflammation of the urethra and mucous membrane of the intestinal canal. The best known of these species are *Cubeba officinalis*, *canina*, *Wallichii*, and others, whose ripe fruits are sold in the shops under the name of *Cubebs*. They are aromatic, pungent, stimulant, and purgative, and act as a specific in stopping gonorrhœal discharges. According to *Martius*, *Artanthe adunca* has the same effect in Brazil; and the Peruvian *Artanthe elongata* has a similar reputation. Of the narcotic Pepperworts the *Ava* or *Macropiper methysticum* is most celebrated. It has a thick, woody, rugged, aromatic rhizome, used in tincture against chronic rheumatism. Macerated in water it forms an intoxicating beverage, employed by the *Otaheitans* to cure venereal affections; they make themselves drunk, after which very copious perspiration comes on; this lasts three days, at the end of which time we are told that the patient is cured. The leaves of *Chavica Betle* and *Siriboa* are chewed by the Malays with lime and slices of the nut of *Areca oleracea* or the *Pinang Palm*. They produce intoxicating effects, stimulate powerfully the salivary glands and digestive organs, and diminish the perspiration of the skin.

As an astringent, a plant called *Matico*, and supposed to be *Artanthe elongata* (*Piper angustifolium*), is found to be a most powerful styptic and a valuable remedy in certain diseases of the genital organs and rectum. It is much used in South America and Belgium, to stop the hemorrhage from small vessels, leech-bites, or incised wounds. It may be applied in leaf, or in fine powder. It is said also to be taken internally for the same purpose, in the form of infusion, in the proportion of about half an ounce to a pint of boiling water. In Peru the plant is called *Moho Moho*, and is extensively used for the same purposes as *Cubebs*, which this Pepper much resembles in smell. An account of it has been given in the *Pharmaceutical Journal*, 3. 472, from which the annexed figure is borrowed, with the permission of the editor. It is, however to be observed, that the Peruvians apply the name *Matico* to the *Eupatorium glutinosum*, a very different plant.

Many other species of this Order are to be found mentioned as plants possessing useful properties; of which here is only space to name *Acrocarpidium hispidulum*, a West Indian plant used as a bitter and stomachic, *Peperomia pellucida* as a salad, *Coccobryon capense* a Cape stomachic, *Artanthe adunca* and *Chavica majuscula*, whose bark is rubefacient, and used in Java against rheumatism, and *Artanthe crocata*, whose spikes of fruit are employed in dyeing yellow.

#### GENERA.

* PEPEROMIDÆ.	<i>Erasmia</i> , <i>Miq.</i>	<i>Cubeba</i> , <i>Miq.</i>	<i>Peltobryon</i> , <i>Kl.</i>
<i>Verhuellia</i> , <i>Miq.</i>		<i>Piper</i> , <i>L.</i>	<i>Sphærostachys</i> , <i>Miq.</i>
<i>Phyllobryon</i> , <i>Miq.</i>	** PIPERIDÆ.	<i>Muldera</i> , <i>Miq.</i>	<i>Artanthe</i> , <i>Miq.</i>
<i>Acrocarpidium</i> , <i>Miq.</i>	<i>Pothomorpha</i> , <i>Miq.</i>	<i>Coccobryon</i> , <i>Klotzsch</i>	<i>Steffensia</i> , <i>Kth.</i>
<i>Peperomia</i> , <i>R et P.</i>	<i>Heckeria</i> , <i>Kth.</i>	<i>Callianira</i> , <i>Miq.</i>	<i>Zippelia</i> , <i>Bl.</i>
<i>Micropiper</i> , <i>Miq.</i>	<i>Macropiper</i> , <i>Miq.</i>	<i>Schilleria</i> , <i>Kth.</i>	<i>Serronia</i> , <i>Guill.</i>
<i>Tildenia</i> , <i>Miq.</i>	<i>Chavica</i> , <i>Miq.</i>	<i>Enckea</i> , <i>Kth.</i>	<i>Ottontia</i> , <i>Spr.</i>
<i>Duguetia</i> , <i>Gaud.?</i>	<i>Rhyncholepis</i> , <i>Miq.</i>	<i>Nematanthera</i> , <i>Miq.</i>	<i>Carpunya</i> , <i>Presl.</i>

NUMBERS. GEN. 20. Sp. 600.

*Urticaceæ.*

POSITION.—*Saururaceæ.*—*PIPERACEÆ.*—*Chloranthaceæ.*

*Polygonaceæ.*



ORDER CXCVII. CHLORANTHACEÆ — CHLORANTHUS.

*Chloranthus*, R. Brown in Bot. Mus., 2199. (1821) ; *Lex. Bot. Collect. Bot.* 17. (1821) ; *Musce & Hymenoptera*, atque *Saururæ*, &c., (1827) ; *Icones Floræ Javæ*, (1828). — *Chloranthaceæ*, Ed. per. A. DC., *Prod. Gen. Vixx.* ; *Moussier Gen.* p. 264.

**DIAGNOSIS.** — *Piperales* *Evogous*, with a solitary carpel, a suspended ovule, a naked endosperm, and opposite leaves with intermediate stipules.

Herbaceous plants or under-shrubs, with an aromatic taste. Stems jointed, banded at the articulations. Leaves opposite, simple, with sheathing petioles and minute intervening stipules. Flowers in terminal spikes. Flowers naked, with a supporting scale. Stamens lateral ; if more than 1, connate, definite ; anthers 1-celled, in *Chloranthus*, bursting longitudinally, each adnate to a fleshy connective, which coheres laterally in various degrees (2-celled, according to some) ; filament slightly adhering to the ovary. Ovary 1-celled ; stigma simple, sessile ; ovule pendulous, orthotropal. Fruit drupaceous, indehiscent. Seed pendulous ; embryo minute, placed at the apex of fleshy albumen, with the radicle inferior, and consequently remote from the hilum ; cotyledons divaricate. *Hedyosmum* and *Ascarina* are both unisexual.

These differ remarkably from *Peppers* and *Saururæ*, in their naked embryo and pendulous ovule. The want of an anniotic sac (or vitellus) is so unexpected in plants otherwise so nearly akin to those Orders, that nothing but the most careful examination would satisfy the mind of that fact. While, however, *Chloranthus* are in other respects inseparably connected with those Orders, a part of them differ in the very important fact of the flowers being absolutely diclinous. This indicates an affinity to the Urtical Alliance. The anthers of *Chloranthus* consist of a fleshy mass, upon the face of which the cell lies that bears the pollen ; whether these anthers are 1- or 2-celled, is a matter of doubt ; one Botanist considering those which have 2 cells to be double anthers, another understanding those with 1 cell to be half anthers. Blume describes a calyx in this genus sometimes present in a rudimentary state, adhering to the ovary, and hence he suspects some affinity between *Chloranthus* and *Opercularia*. But I am persuaded that no such rudiment exists: it is not represented in Blume's figures.

Natives of the hot parts of India and South America, the West Indies, and Samoa Islands.

The whole plant of *C. officinalis*, and *brachystachys*, has an aromatic fragrant odour, which is gradually dissipated in drying ; but its roots retain a fragrant camphorated smell, and an aromatic, somewhat bitter, flavour. They are found to possess very nearly the properties of *Aristolochia serpentaria*, and to as high a degree. There seems to be no doubt that they are stimulants of the highest order. The resiniferous

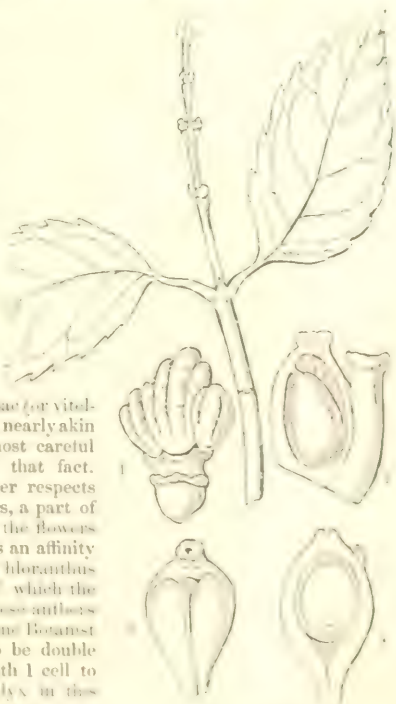


FIG. CCCLV.

FIG. CCCLV.—*Chloranthus monostachys*. 1. external view of a flower, 2. longitudinal section of it, the anther being removed, 3. a ripe fruit, 4. a longitudinal section of a ripe fruit.



of Java employ the roots in infusion, or rubbed up with the bark of *Cinnamomum Culilawan*, as a remedy for spasms in pregnant women. In like manner, mixed with such carminative substances as Anise and Ocymum, they are administered with great success in the malignant small-pox in children. An infusion of the dried root is successfully employed in fevers attended with great muscular debility and a suppression of the functions of the skin. In a typhus which ravaged certain districts of Java, in consequence of long-continued rains following an unusually protracted dry season, the symptoms attendant upon which were extreme debility, a languid pulse, stupor, violent vomiting and bilious evacuations, the roots of this *Chloranthus* were of the greatest service. It was again employed most beneficially in a malignant intermittent fever which visited Java in the year 1824. In such cases the infusion was usually combined with a decoction of *Cedrela Toona*. The root has the great merit of preserving its active properties for a long time if properly prepared, and there can be no doubt that it is one of the most efficacious of all known remedial agents, wherever there is a necessity for continual and active stimulants.—*Blume*. Endlicher says that the dried branches of *Ascarina polystachya*, called Earaihan in Tahiti, still retain their hot flavour in the specimens collected during Forster's voyage. Similar qualities seem to exist in the *Hedyosmums*, which are used in the West Indies as antispasmodics and stomachics: *H. Bonplandianum* is, according to Martius, used in Brazil in malignant fevers and pains in the limbs.

#### GENERA.

*Hedyosmum*, Swartz.  
*Tufalla*, Ruiz et Pav.  
*Ascarina*, Forst.

*Chloranthus*, Swartz.  
*Nigrina*, Thunb.

*Creodus*, Loureir.  
*Cryphæa*, Hamilt.

*Peperidia*, Rchb.  
*Stropha*, Noronh.  
*Sarcandra*, Gardn.

NUMBERS. GEN. 3. Sp. 15.

*Urticaceæ.*

POSITION.—*Piperaceæ.*—*CHLORANTHACEÆ.*—*Saururaceæ.*



ORDER CXCVIII. SAURURACEÆ.—SAURURACEÆ

Saururus, *Rich. Acad. 1805*. *Mane d. Houttuynia*, *caput Saururæ*, 1787; *Mane d. Houttuynia*, 1805; *Mane d. Houttuynia*, 1805; *Mane d. Houttuynia*, 1805; *Mane d. Houttuynia*, 1805.

DIAGNOSIS.—*Piperid* Fronds, with several distinct carpels, the ovary sessile, the calyx long, the stamens, and alternate stipulate leaves.

Herbaceous plants, growing in marshy places. Leaves alternate, with stipules. Flowers growing in spikes, naked, seated upon a scale,  $\frac{1}{2}$ . Stamens 1 to 5, variable. Hypogynous, persistent; filaments slender; anthers continuous with the filament, cuculate, with a thick connative and 2 lateral lobes bursting longitudinally. Ovaries 3 or 4, more or less distinct, with one ascending orthotrope ovule and a sessile recurved stigma, or connate into a 3- or 4-celled pistil, with a few orthotrope ovules ascending from the edge of the projecting semi-dissepiments. Fruit either consisting of 4 fleshy indehiscent nuts, or a 3- or 4-celled capsule, opening at the apex and containing a few ascending seeds. Seeds with a membranous integument; embryo minute, lying in a fleshy lenticular sac, which is seated on the outside of hard mealy albumen at the apex of the seed.

These plants are very near Pepperworts, with which they agree in habit, but from which they differ in the compound nature of their ovary, and their alternate constantly stipulate leaves. It has been supposed that they destroyed the distinction between Eragrostis and Eragrostis, but this opinion was formed upon incorrect views, and especially upon the erroneous supposition that the genus *Apogeton*, now known to belong to *Arris*, was a part of the Order of Saururaceæ. If M. Decaisne is right in referring his *Gymnochea* hitherto, which is very doubtful, we shall have the singular combination in the same Order of distinct one-seeded carpels, and an inferior ovary with many seeded parietal placentæ.—See *LOASACEÆ*.

The species are natives of North America, China, and the north of India, growing in marshes or pools of water.

*Saururus cernuus* has been found to be somewhat aroid; its root, made into a poultice, is employed in North America in pleurisy. The leaves of *Houttuynia* are regarded as emmenagogues by the Celestial Chinese.

GENERA

<i>Saururus</i> , Linn.	<i>Arundinaria</i> , Hook.
<i>Mane d. Houttuynia</i> , Guss.	<i>Arundinaria</i> , Nutt.
<i>Houttuynia</i> , Thunb.	<i>Gymnochea</i> , Decaisne.
<i>Piperid</i> , Linn.	

NUMBERS. GEN. 4. Sp. 2.

POSITION.—SAURURACEÆ—PIPERALES

Fig. CCCLVI.—1, *Houttuynia cordata*. 2, flower of *Saururus pinnatifidus*. 3, the fruit. 4, the seed divided perpendicularly.



## SUB-CLASS III. PERIGYNOUS EXOGENS.

The first group in this Sub-class is so evidently allied to the Chenopodal Alliance, that the genera are in many cases referred to the one or the other according to the varying views of systematists, and Basellads are really almost always considered as a perigynous form of Chenopods, which, moreover, are in certain cases, as for example in Beet, truly perigynous. This seems to show that Chenopodals on the one hand, and Ficoidals on the other, form the boundary between the Hypogynous and Perigynous series.

It is evident that in the Alliances which are thus collected, there is a constant and powerful tendency to the cohesion of the floral organs, for half of them consists of Orders having monopetalous flowers, a structure which is rare in the hypogynous Sub-class, and if it is seen there, is seldom accompanied by any union of the stamens to the petals, such an occurrence, when it is observable, as in Epacrids, being altogether exceptional. Here, on the contrary, the monopetalous corolla is habitually associated with epipetalous stamens. The tendency to adhesion is not indeed confined to the separate parts of the same ring of organs, or to the stamens with the calyx or corolla, but also not unfrequently occurs between the ovary and the parts which grow around it; the consequence of which is, that we find a partly inferior ovary in nearly every one of the Alliances of the Perigynous Sub-class. But although this is a manifest approach to the condition of the Epigynous Class, yet it is seldom the cause of any confusion, because the combination of the calyx, corolla, and stamens with each other is only partial, and is rarely accompanied by a similar cohesion of the carpels, whose styles remain separate even when their ovaries are consolidated. This is obvious among Appleworts and Hydrangeads, two quasi-epigynous forms of the Ranal and Saxifragal Alliances.



## ALLIANCE XI. FICOIDALES.—THE FICOIDAL ALLIANCE.

DIAGNOSIS.—*Perigynous Exogams, with monochlamydeous flowers, central or axillary placentae, a perigynous corolla, if one is present, and an external embryo, seated round a small quantity of mealy albumen.*

These plants are for the most part fleshy-leaved herbs or bushes, bearing very great resemblance, in some cases, to Purslanes in the Silenal Alliance, and like those plants, having for their character a central placentation combined with an annular embryo and mealy albumen. They are, in fact, the perigynous form of Silenals, and must be regarded as standing on the frontier of that Alliance. Like Silenals, the Ficoidals comprehend plants both with a high development of the corolla, and without a trace of it. They approach the Epigynous structure in some respects; but although their carpels are partially adherent with the calyx in a large proportion of the Alliance, yet the styles are almost always distinct, and generally the carpels also in some degree. Torch-thistles are no doubt a kindred race, but the exigencies of a linear arrangement compel the systematist to separate them by a long interval.

The great marks of the Ficoidal Alliance are the perigynous stamens, curved external embryo, and mealy albumen. It may be presumed that its axillary placentation is a mere modification of the central, and not derived from the margins of carpellary leaves; but this is a point which cannot be always decided.

## NATURAL ORDERS OF FICOIDALS.

<i>Petals absent. Sepals distinct. Fruit inclosed in a hardened calyx, or succulent calyx. Carpel single, solitary. Seed erect . . .</i>	199. BASILICARACEÆ
<i>Petals numerous, conspicuous. Carpels several, associated . . .</i>	200. MESSEMBRYACEÆ
<i>Petals absent. Carpels several, associated . . .</i>	201. EUPHORBACEÆ
<i>Petals absent. Sepals united into a tube. Carpel single, solitary. Fruit inclosed in the hardened calyx tube . . .</i>	202. SCHEUCHZERIACEÆ



## ORDER CXCIX. BASELLACEÆ.—BASELLADS.

Basellaceæ, Moquin Tandon *Chenopod. Monogr. p. 10. (1840).*

DIAGNOSIS.—*Ficoid al Exogens, with distinct sepals, no petals, fruit inclosed in a membranous or succulent calyx, a single solitary carpel, and an erect seed.*

Climbing, herbaceous, or shrubby plants, usually somewhat succulent. Leaves alternate, without stipules. Flowers coloured, naked, sessile or stalked, sometimes without bracts. Sepals imbricated in two rows, fleshy, hardly opening. Stamens

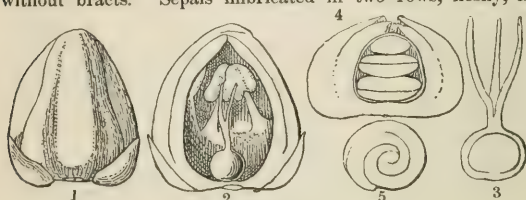


Fig. CCCLVII.

opposite the sepals, inserted into their sides; anthers 2-celled, (in *Basella*, opening outwards longitudinally.) Ovary free, simple, one-celled, with a single erect, sessile, anatropal ovule; styles several. Fruit membranous. Embryo annular, or coiled up spirally, with

mealy albumen in the centre, or separated into two superficial masses; radicle inferior.

These plants, which have all the general characters of scandent *Chenopods*, have been separated from that Order on account of their coloured calyx, which scarcely opens, and has its sepals distinctly arranged in two rows, and their perigynous stamens. The anthers in *Basella* are moreover turned outwards, but I know not how far that is characteristic of the Order. *Basellads* differ from *Scleranthus* in the want of a hardened tube to cover over the seed-vessel, and from *Aizoons* in the perfect simplicity of their carpel.

The species are all tropical, with the exception of *Lophiocarpus*, a Siberian plant, if it really belongs here.

*Basella rubra* and *alba* are employed as pot-herbs in the East Indies, where they are held in some esteem as a substitute for Spinage. *B. tuberosa* has a great fleshy root, which is eaten by the women of Quito, under the idea that it increases their fecundity. *Basella rubra* yields a very rich purple dye, but it is said to be difficult to fix.

## GENERA.

*Basella*, L.  
*Gandola*, Rumph.  
*Boussingaultia*, H. B. K.  
*Anredera*, Juss.  
*Clarisia*, Abat.

*Mellocia*, Lindl.  
*Ullucus*, Lozano.  
*Tournefortia*, Moq.  
*Tandonia*, Moq.

NUMBERS. GEN. 4. Sp. 12.

*Chenopodiaceæ.*POSITION.—*Tetragoniaceæ.*—BASELLACEÆ.—*Scleranthaceæ.*

Fig. CCCLVII.—*Basella rubra*. 1. a flower; 2. the same opened vertically; 3. ovary; 4. the ripe fruit and inverting calyx divided perpendicularly; 5. the embryo.



## ORDER CC. MESEMBRYACEÆ.—FICOIDÆ.

Ficoides, Juss. Gen. 315. 1789. Dict. Sc. Nat. 16. 528. (1820. DC. Prodr. 3. 415. 1828. Juss. Hb. Moench. Mesemb. 1834. Moench Gen. 129. Mesembryaceæ, L.f. p. XXV. 1831. M. Fendl. Gen. ex Fendl. in Ann. Bot. Berol. 1. 147. —Lewiside, Hook. in Bot. Beechey, p. 36. 1846. Juss. Natul. Fr. Rocky Mount. p. 24.

DIAGNOSIS. *Ficoides* *Euphorbiæ*, with numerous conspicuous petals, and several consolidated carpels.

Shrubby or herbaceous succulent plants, with opposite simple leaves. Flowers complete, often showy, always terminal, although, from the shortness of the branches on which they grow, apparently lateral; often opening only under the influence of sunshine, and closing in its absence. Sepals definite, usually 5, but varying from 4 to 8, more or less combined at the base, either cohering with the ovary, or distinct from it, equal or unequal, with a quincuncial or valvate æstivation. Petals indefinite, coloured, in many rows. Stamens arising from the calyx, indefinite, distinct; anthers oblong, incumbent. Ovary inferior, or nearly superior, many-celled or one-celled; stigmas numerous, distinct. Ovules 60, amphitropal, attached by cords to a central placenta, which is either wholly free, or united to the edges of the carpels, or sometimes spread over the back of the cavity of each cell. Capsule surrounded by the fleshy calyx, many-celled or 1-celled, opening in a stellate manner at the apex, or when free from the calyx splitting at the base. Seeds definite, or more commonly indefinite, attached to the inner angle of the cells; embryo lying on the outside of mealy albumen, curved or spiral, with the radicle next the hilum.



FIG. CCCLVIII.

These are the most perfect of the Ficoidæ Alliance, for the carpels are numerous and consolidated, and the apparatus of the corolla abundant and richly coloured. In this respect, indeed, Ficoids approach the Torch-thistles, although otherwise so different. They are to Ficoids what Purslanes or Clove-worts are to Silenals, the princes of their race. One of the most singular facts connected with them is the variable nature of their placenta, which sometimes occupies the centre, to which the edges of the carpellary leaves are closely applied, sometimes runs up the back, altogether surrounding the centre, as in *Mesembryanthemum acinaciforme* (See *Index Botany*, vol. ii. t. xxxi. 2.), and is sometimes absolutely free, as in *Lewiside*. This curious genus, however, differs a little from the rest of the Order in its perfectly enclosed fruit, and barely perigynous stamens. It is however near *Glinus*, and there does not seem to be any necessity for regarding it as the type of a peculiar Order. The seed-cases of the Ficoids exhibit remarkable phenomena, closing when placed in water, opening again when dried, a hygrometrical quality doubtless connected with their mode of life. Inhabitants of the dry places of southern Africa, they only expand and discharge their seeds when rain falls to relax their tissue, for then only would the seeds be able to germinate. This is more especially evident in *M. Trujana*, which has been called under the name of *Flores Candide*.

The hottest sandy plains of the Cape of Good Hope contain the largest part of this Order. A few are found in the south of Europe, north of Africa, Chile, China, Persia, and the South Seas.

The succulent leaves of a few are eaten, as of *Mesembryanthemum salsola*, which is

Fig. CCCLVIII.—*Mesembryanthemum*. 1. its fruit; 2. the same opened; 3. a seed; 4. the same divided perpendicularly.



the Hottentot's Fig of the Cape colonists; *Mesembryanthemum emarcidum*, when bruised and fermented, acquires a narcotic property, and is chewed like Tobacco by the Hottentots (*Burnett*); others yield an abundance of soda. *M. crystallinum* in Spain, and *M. copticum* and *nodiflorum* in Egypt, are collected for the purpose of furnishing alkali for glassworks; the former is called *Barilla Moradera* by the Spaniards, who import large quantities of its ashes from the Canaries, where the seeds are eaten as a common food, according to Broussonet. *Mesembryanthemum nodiflorum* is used in the manufacture of Maroquin leather. *M. crystallinum* (the Ice-plant) is remarkable for the abundance of watery pustules with which it is covered; its juice is said to be diuretic, and has been prescribed in dropsy and liver complaints. *M. geniculiflorum* is used in Africa as a potherb, and its seeds are ground into flour. *Lewisia rediviva* is an article of food among the natives of north-west America, who call it *Spatulum* or *Spæt'lum*. The roots, after the bark is stripped off, seem from the relation of travellers to consist of little more than starch.—*Gray and Torrey*, 1. 678. The natives of Australia eat the fruit of *M. æquilaterale* (Pig-faces, or Canagong). The seed-vessel of this plant is about an inch and a half long, of a yellowish, reddish, or green colour, and somewhat obconical. The pulp is sweetish and saline.—*Backhouse*.

# GENERA.

<i>Mesembryanthemum</i> , L.	<i>Glinus</i> , L.	<i>Physa</i> , Thouars.	<i>Axonotichium</i> , Fenz.
<i>Hymenogyne</i> , Haw.	<i>Roloffia</i> , Adans.	<i>Orygia</i> , Forsk.	<i>Lewisia</i> , Pursh.
<i>Mesembryon</i> , Adans.	<i>Plenckia</i> , Rafin.	<i>Corbichonia</i> , Scop.	? <i>Beloanthera</i> , Hassk.

NUMBERS. GEN. 5. Sp. 375.

*Cactaceæ.*

POSITION. ——— MESEMBRYACEÆ. — Tetragoniaceæ.

*Portulacææ.*

*Glinus* is referred by Ach. Richard (*Fl. Abyss.*, i. 48) to *Mollugo*, in *Caryophyllaceæ*.

The *Lewisia rediviva* is said by Mr. Geyer to be the *Racine amère* of the Canadian Voyageurs—pungent and spicy when raw—agreeable and wholesome when cooked. It is also called Tobacco root, because when cooked it has somewhat the smell of chewing tobacco. A long account of it will be found in the *London Journal of Botany*, V. 306.



## ORDER CCL. TETRAGONIACEÆ. — AIZOON.

*Tetragonia*, *Ed. Jac.* p. 200 (1790). *Tetragonia*, *Aubl.* *Bot.* *Sav.* p. 317.  
*Succulentae*, *Boiss.* *Diagn.* 2, 42.

DIAGNOSIS. *Perennial* *herbaceous*, with *no petals*, and *several* *commutated* *sepals*.

Succulent leaved herbaceous plants, or occasionally small shrubs. Leaves alternate, often covered with watery pustules, without stipules. Flowers small, axillary. Calyx 5 cleft, free, or partially adherent to the ovary. Corolla 0. Stamens definite, alternate with the sepals, if they bear any relation to them. Ovary 2-lobed; ovules suspended or ascending, solitary or several, anatropal, always with a long cord; torus superior in the suspended species. Styles as many as the cells of the ovary, distinct. Fruit either an indehiscent tough-shelled nut, or a capsule splitting all round. Seeds with an annular embryo, curved round mealy albumen.

The distinction of Aizoons resides in their want of petals and small number of stamens, otherwise they are like Ficoids. They participate in the affinity of that Order, but approach nearer to the Chenopods, among which Beta has the adherent calyx of a Tetragonia. Cypsolea, and the genera near it, also establish a connection with Purslanes, which are positively known by their 2-leaved calyx.

The species, which are plants of no beauty, are found in the South Sea Islands, the residence more especially of Tetragonias, in the Mediterranean, the Cape of Good Hope, or various parts of the tropics.

They are universally insipid or slightly saline, whence they are suited for human food. Tetragonia expansa, a New Zealand annual, is a good deal cultivated in Europe, under the name of New Zealand Spinage, as a substitute for which herb it is employed. Succinum pertusacastrum and repens are used for the same purposes in the tropics of Asia. The ashes of Aizoon canariense and hispanicum abound in soda.

## GENERA.

Subgenus I. *Tetrago*. *Tetragonia*, *Mej.*  
 Leaves. Fruit woody, *Aizoon*, *Link.*  
*perfoliata*, *Forst.*  
*Tetragonia*, *Link.* *Purslane*, *Willd.*  
*Galeota*, *Link.*  
*Canariensis*, *Presl.*  
*Tetragonia repens*, *Com.* *Sedoides*, *Forst. et Zeyh.*  
*Plinthia*, *Presl.*

Subgenus II. *Succinea*. *Succinea*, *Link.*  
 Capsule. *Succinea*, *Link.*  
*Tristemon*, *Sav.* *Protophylla*, *Link.*  
*Zinnia*, *Link.* *Alouatta*, *Link.*  
*Diplopoda*, *Presl.* *Chamaecrista*, *Link.*  
*Diploclonum*, *Presl.*

NUMEROUS. GEN. II. Sp. 11.

*Chamaecrista*.

POSITION. Mesembryaceæ. — *Tetragoniaceæ*. — *Succineæ*.  
*P* *perfoliata*.

Fig. CCCIX. — Tetragonia. 1, a flower; 2, the valves spread out; 3, the fruit; 4, a transverse section of it; 5, an ovule; 6, a section of a seed.



## ORDER CCII. SCLERANTHACEÆ.—SCLERANTHS.

*Scleranthæ*, Link *Enum.* 417. (1821); *DC. Prodr.* 3. 377. (1828) a § of *Illecebræ*; *Bartl. Ord. Nat.* 300. (1830); *Meisn. Gen.* p. 133; *Endl. Gen.* p. 962.

DIAGNOSIS.—*Ficoid* *Exogens*, with no petals, a tubular calyx becoming hardened and covering the fruit, consisting of a single solitary carpel.

Small inconspicuous herbs. Leaves opposite, without stipules. Flowers minute, axillary, sessile. Calyx 4- or 5-toothed, with a stiff tube. Stamens from 1 to 10, inserted into the orifice of the tube. Ovary simple, superior, 1-seeded; styles 2, or 1, emarginate at the apex. Ovules 1 or 2, amphitropal, hanging down from the point of a slender cord which rises from the base of the ovary. Fruit a membranous utricle inclosed within the hardened calyx. Seed pendulous from the apex of a funiculus, which arises from the bottom of the cell; embryo cylindrical, curved round farinaceous albumen; radicle superior, but next the hilum.

The weedy plants called *Scleranthus*, are by most Botanists, and among the rest by De Candolle, referred to *Knotworts*, from which they differ in the absence of petals and stipules, in the indurated tube of the calyx, from the orifice of which the stamens proceed, and in the number of the latter often exceeding that of the divisions of the calyx. They are, in fact, perigynous *Chenopods*, rather than *Knotworts*. Their affinity seems, however, to be quite as great with *Nyctagos*, with which they agree in most respects except their truly perigynous stamens and small herbaceous ribbed calyx.

Fenzl proposes to divide this trifling Order into two tribes, viz. *Euscleranthæ*, and *Habrosiæ*, but the advantage of doing so is not obvious.

The species are found in barren fields in Europe, Asia, and North America, and in sterile places in countries of the southern hemisphere beyond the tropics. A single species is described from Peru.

They are all uninteresting weeds, of no known use.

## GENERA.

*Mniarum*, Forst.

*Ditocot*, Banks.

*Scleranthus*, L.

*Guilleminia*, H. B. K.

*Habrosia*, Fenzl.

NUMBERS. GEN. 4. Sp. 14.

*Chenopodiaceæ*.

POSITION.—*Tetragoniaceæ*.—SCLERANTHACEÆ.—*Basellaceæ*.

*Nyctaginaceæ*.

Fig. CCCLX.—*Scleranthus perennis*. 1. young calyx forced open; 2. perpendicular section of ripe calyx; 3. ovary; 4. anther; 5. section of seed.



## ALLIANCE XII. DAPHNALES.—THE DAPHNAL ALLIANCE.

DIAGNOSIS.—*Perigynous* flowers, with somewhat elongated flowers, a solitary ovule, and an elongated calyx, without peduncle.

The Daphnal Alliance consists almost exclusively of shrubs and trees, usually evergreen, and often of large dimensions. It is defined by its flowers being hemispherical, or, if there be a corolla, by the ovulipetals having altogether the colour, texture, and quality of the calyx. It differs from the Rosal Alliance in the total absence of anamen, and its great almond-like embryo; nevertheless its Daphnoids approach Rosals in consequence of the resemblance between some *Passerites* and *Schreberias*. With Rosals it agrees in the nature of its embryo, but is distinguished by the want of petals, or, losing that distinction, by its ovary having a vertical style, which in Rosals *ovules* stand more or less obliquely with respect to the ovary. This renders it probable that the fruit of Daphnals is really composed of two or more valvate carpels *cohering round a single ovule*, as happens in the Order of Rosaceae, while in Rosals the carpels are absolutely simple.

If we regard the further end of the chain of Daphnoids we find that Laurals have Calycanthis among Rosals. Laurals, too, indicate a tendency towards the Rosal Alliance, in consequence of their flowers being occasionally unisexual, and seem to bring Daphnals into the vicinity of Plum Nutmegs.

There is also a very strong approach on the part of Daphnals to Rosaceae, as indicated by the tubular calyx of the latter and their constant tendency to lose their petals. In fact, the two Alliances must stand in actual contact, for there is little to distinguish them except the simple fruit of the one and the compound fruit of the other.

## NATURAL ORDERS OF DAPHNALES.

Calyx bursting lengthwise. Apetalous or polypetalous. Ovary solitary, suspended. Calyx tubular.	203. ERYTHRODIA.
Calyx bursting lengthwise. Apetalous. Ovules erect. Calyx simple.	204. ERYTHRODIA.
Calyx bursting by recurved calyx. Fruit pericarp. Fruit naked.	205. ERYTHRODIA.
Calyx bursting by recurved calyx. Fruit pericarp. Fruit naked.	206. ERYTHRODIA.



## ORDER CCIII. THYMELACEÆ.—DAPHNADS.

Thymelææ, *Juss. Gen.* 76. (1789); *R. Br. Prodr.* 358; *Bartling Ord. Nat.* 114. (1830).—Daphnoideæ, *Vent. Tabl.* ii. 235. (1799); *Endl. Gen.* cix.—Daphnaceæ, *C. A. Meyer, Ann. Sc.* xx. 45.—Anthoboleæ, *Martius Conspectus*, No. 81. (1835).—Exocarpeæ, *Arnott in Edinb. Encycl.* 128, a § of Santalaceæ, (1832).—Hernandiæ, *Blume Bijdr.* 550. (1825); *Ed. Pr.* cxlvi.; *Endl. Gen.* p. 232.

DIAGNOSIS.—*Daphnal Exogens*, with apetalous or polypetalous flowers, anthers bursting lengthwise, a solitary suspended ovule, and an imbricated calyx.

Stem shrubby, very seldom herbaceous, with tenacious bark. Leaves without stipules, alternate or opposite, entire. Flowers capitate or spiked, terminal or axillary,



Fig. CCCLXI.

occasionally solitary, sometimes ♂-♀ by abortion, often inclosed in an involucre. Calyx inferior, tubular, coloured; the limb 4-cleft, seldom 5-cleft, with an imbricated æstivation. Corolla 0, or sometimes scale-like petals in the orifice of the calyx. Stamens definite, inserted in the tube or its orifice, often 8, sometimes 4, less frequently 2; when equal in number to the segments of the calyx or fewer, opposite to them; anthers 2-celled, dehiscing lengthwise in the middle. Ovary composed of a single carpel, with one solitary pendulous anatropal ovule; style 1; stigma undivided. Fruit hard, dry, and nut-like, or drupaceous. Albumen none, or thin and fleshy; embryo straight; cotyledons plano-convex, sometimes lobed and crumpled; radicle short, superior.

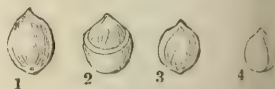


Fig. CCCLXII.

The true affinity of Daphnads, notwithstanding the commonness of the species, does not seem well ascertained. They are generally associated with Oleasters; and if the genus *Elæagnus* really belongs to that Order, it must be admitted that the main distinction between the two Orders consists in the separate sexes of Oleasters. To Proteads they certainly approach, especially in the stamens being opposite to the segments of the calyx, but Daphnads have a pendulous ovule, and Proteads an erect one; in the former, too, the calyx is imbricated, in the latter, valvate. Laurels are known by their reflexed anther-valves. As to Sandalworts, with which Daphnads are often compared, they are far removed by their inferior ovary and copious albumen. Aquilariads have a compound ovary, and therefore belong to the Rhamnall Alliance. A supposed Natural Order, called by Blume *Hernandiaceæ*, merely consists of Daphnads with polygamous

Fig. CCCLXI.—*Daphne Mezereum*. 1. a flower cut open; 2. a vertical section of an ovary; 3. the fruit.

Fig. CCCLXII.—*Daphne Mezereum*.—*Gartner*. 1. fruit; 2. the same with a portion of the succulent rind removed; 3. seed; 4. embryo.







## ORDER CCIV. PROTEACEÆ.—PROTEADS.

Proteaceæ, *Juss. Gen.* (1789); *R. Brown in Linn. Trans.* 10. 15. (1809); *Prodr.* 363; *Suppl. Prim.* (1830); *Endl. Gen.* cxiii.; *Meisner Gen.* p. 331.

DIAGNOSIS.—*Daphnal Exogens*, with apetalous flowers, anthers bursting lengthwise, erect ovules, and a valvate calyx.

Shrubs or small trees. Branches usually umbellate. Leaves hard, dry, divided or undivided, opposite or alternate, without stipules; their cuticle often covered equally on both sides with stomates. Calyx 4-leaved, or 4-cleft, with a valvate æstivation. Stamens 4, sometimes in part sterile, opposite the segments of the calyx. Ovary consisting of a single carpel, superior; style simple; stigma undivided; ovule one, or two collateral, or several in two rows, anatropal or amphitropal, and ascending. Fruit dehiscent or indehiscent. Seed without albumen; embryo with two or occasionally several cotyledons, straight; radicle inferior, next the hilum, or parallel with it.

There is no difficulty in distinguishing this Order; the hard woody texture of the leaves, the irregular tubular calyxes with a valvate æstivation, the stamens placed upon the lobes, along with a dehiscent fruit, at once characterise it. By these marks it is known from Daphnads and all other Orders. According to Brown, the radicle pointing towards the base of the fruit in all Proteads, is a circumstance of the greatest importance in distinguishing the Order from those most nearly related to it; and its constancy is more remarkable, as it is not accompanied by the usual position or even uniformity in the situation of the external umbilicus.—*Linn. Trans.* 10. 36. He has also remarked, with his usual acuteness, that in consequence of the presence of hypogynous scales, we may expect to find octandrous genera belonging to this family. The same writer observes, that there is a peculiarity in the structure of the stamens of certain genera of Proteads, namely, *Simsia*, *Conospermum*, and *Synaphea*, in all of which these organs are connected in such a manner

that the cohering lobes of two different anthers form only one cell. Another anomaly equally remarkable exists in *Synaphea*, the divisions of whose barren filament so intimately cohere with the stigma, as to be absolutely lost in its substance, while the style and undivided part of the filament remain perfectly distinct. In another place he remarks: "A circumstance occurs in some species of *Persoonia*, to which I have met with nothing similar in any other plant: the ovarium in this genus, whether it contain one or two ovula, has never more than one cell; but in several of the 2-seeded species, a cellular substance is, after fecundation, interposed between the ovula, and this gradually indurating, acquires in the ripe fruit the same consistence as the putamen itself, from whose substance it cannot be distinguished; and thus, a fruit originally of one cell becomes bilocular; the cells, however, are not parallel, as in all those cases where they exist in the unimpregnated ovarium, but diverge more or less upwards." This is subsequently explained by the same author (*King's Appendix*), by the cohesion of the outer membranes of the two collateral ovules, originally distinct, but finally constituting this anomalous dissepiment, the inner membrane of the ovule consequently forming the outer coat of the seed.

A happier name than that of Proteads could not have been devised, for the diversity of appearance presented by the various genera is such as it would be hard to parallel in

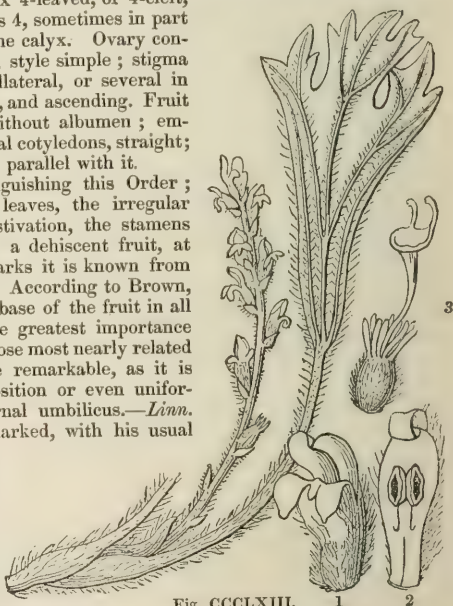


Fig. CCCLXIII.

Fig. CCCLXIII.—*Synaphea dilatata*.—*Ferd. Bauer*. 1. a flower; 2. one of its lobes; 3. the ovary and style and stigma.



the same Natural Order. On the one hand, we have the hard-coned Banksias, and the close-headed Dryandras; then come the loose-flowered Hakeas and Grevilleas; and the ranks are closed by anomalous genera, bearing the names of Synaphea, Conospermum, Franklandia, &c.

The principal stations of this Order are the Cape of Good Hope and adjacent regions, and New Holland. A few only occur in South America, the Malay Archipelago, and elsewhere in the southern hemisphere; in the northern they are scarcely known. Protea abyssinica is, however, found in 2 Abyssinia, and P. Paulina in Sennaar. In general they occur in land unfit for cultivation. Few are of

considerable size. Mr. Frazer has reported the existence of a plant he referred to Banksia grandis, with a trunk fifty feet high, and frequently more than two feet and a half in diameter, occupying the barren hills on the banks of the river, at Point Frazer, in the Swan River Colony; and Grevillea robusta, and Knightia excelsa, are other instances of the species acquiring a considerable stature.

Handsome evergreen shrubs, much prized by gardeners for the neatness of their appearance, and the beauty or singularity of their flowers. They are commonly employed as fire-wood at the Cape of Good Hope. The fruit of Guevinia is sold like nuts in the markets of Chile, under the name of Avellano.

Waggon wheels are constructed at the Cape of Good Hope from the wood of Protea grandiflora, which is called, in consequence, Wagen boom. The dried flowers of Petrophila brevifolia give out to boiling water so brilliant a yellow colour, that it is possible the plant might be turned to account by dyers. The same may be said of Persoonia macrostachya. The bark of Protea grandiflora is used by the Cape settlers in diarrhoea. The seeds of Brabejum stellatum are roasted and eaten like Chestnuts; their shells form a substitute for coffee. The honey that flows from the flowers of Protea mellifera and speciosa is boiled down at the Cape of Good Hope, and used against coughs. It is reported by Endlicher that the root of Banksia marcescens is emetic; but upon no known authority. Upon the whole, the Order must be regarded as one of the most useless to man, notwithstanding the beauty of the flowers and foliage of so many species.

# GENERA.

## I. NUCAMENTACEÆ.

### Tribe I. Proteidæ.

Aulax, Berg.  
Leucadendron, Herm.  
Conocarpus, Adans.  
Euryperum, Salisb.  
Gissodia, Salisb.  
Chasme, Salisb.  
Petrophila, R. Br.  
Arctostigma, Endl.  
Petrophila, Endl.  
Symphylolepis, Endl.  
Xerostole, Endl.  
Isopogon, R. Br.  
Alydus, Salisb. part.  
Eustrobilus, Endl.  
Hypsanthus, Endl.  
Protea, Linn.  
Leucadendron, Linn.

Lepidocarpodendron, Boerh.  
Scolymocephalus, Hm.  
Erodendrum, Salisb.  
Pleuranthus, Salisb.  
Gagnadi, Bruce.  
Leucospermum, R. Br.  
Conocarpodendron, Bh.  
Diastella, Salisb.  
Mimetes, Salisb.  
Hypophyllocarpodendron, Boerh.  
Serruria, Salisb.  
Serraria, Burm.  
Nivenia, R. Br.  
Pantomus, Salisb.  
Sorocephalus, R. Br.  
Soranthe, Salisb.  
Mischocaryon, Endl.  
Cardiocaryon, Endl.  
Spatalla, Salisb.  
Coilostigma, Endl.

Cyrtostigma, Endl.  
Adenanthos, Labill.  
Tribe II. Conospermidæ.  
Synaphea, R. Br.  
Conospermum, Smith.  
Chilurus, R. Br.  
Isomerium, R. Br.  
Stirlingia, Endl.  
Simisia, R. Br.

Tribe III. Franklandiæ.  
Franklandia, R. Br.

Tribe IV. Persooniæ.

Symphynema, R. Br.  
Agastachys, R. Br.  
Cenarrhates, Labill.  
Persoonia, Smith.  
Pentadactylon, Gartn.

Isokera, Cavon.  
Brabejum, Linn.  
Brabyia, Linn.  
Guevinia, M.  
Guevinia, R. et Pav.  
Ara, Endl.  
Bellendena, R. Br.

II. FORCETACEÆ.

Tribe I. Grevilleæ.

Anadenia, R. Br.  
Muhlenbergia, Endl.  
Grevillea, R. Br.  
Lissostylis, R. Br.  
Lissostylis, R. Br.  
Erythronium, R. Br.  
Stylidium, Salisb.  
Stylidium, R. Br.  
Stylidium, R. Br.  
Stylidium, R. Br.

Fig. CCCLXIV.—Hakea acicularis.—Endl. Boerh. 1. a couple of flowers; 2. a flower magnified; 3. the pistil; 4. a fruit; 5. a seed; 6. half an embryo.



<i>Cycloptera</i> , R. Br.	<i>Roupala</i> , Aubl.	<i>Embothrium</i> , Forst.	Tribe II. Banksidæ.
<i>Hakea</i> , Schrad.	<i>Leinkeria</i> , Scop.	<i>Oreocallis</i> , R. Br.	<i>Banksia</i> , Linn. fl.
<i>Conchium</i> , Smith.	<i>Dickkeeria</i> , Flor. Fl.	<i>Telopea</i> , R. Br.	<i>Isostylis</i> , R. Br.
<i>Lambertia</i> , Smith.	<i>Andripetalum</i> , Schott.	<i>Hylogyne</i> , Salisb.	<i>Dryandra</i> , R. Br.
<i>Xylomelum</i> , Smith.	<i>Andriapetalum</i> , Pohl.	<i>Lomatia</i> , R. Br.	<i>Josephia</i> , Salisb.
<i>Orites</i> , R. Br.	<i>Helicia</i> , Lour.	<i>Tricandylus</i> , Salisb.	<i>Hemiclidia</i> , R. Br.
<i>Amphiderris</i> , R. Br.	<i>Helitophyllum</i> , Blum.	<i>Amphiloma</i> , Endl.	" "
<i>Oritina</i> , R. Br.	<i>Knightia</i> , R. Br.	<i>Stenocarpus</i> , R. Br.	? <i>Cylindria</i> , Lour.
<i>Adenostephanes</i> , Klotzh.	<i>Eucarpha</i> , R. Br.	<i>Cybele</i> , Salisb.	
<i>Rhopala</i> , Schreb.		<i>Aguostus</i> , A. Cunn.	

NUMBERS. GEN. 44. Sp. 650.

*Santalacæ.*

POSITION.—Thymelacæ.—PROTEACEÆ.—Lauracæ.

ADDITIONAL GENERA.

*Faurea*, Harvey, near Protea.

*Orothamnus*, Pappe, near Mimetes.







stamens. According to Nees von Esenbeck, their ovary is composed of three carpels; and, if so, they are as near Buckthorns as Daphnads; but this opinion does not seem to be supported by sufficient evidence; on the contrary, the exterior of the ovary and its interior cavity present all the appearance of simplicity, unless a trifling and occasional lobing of the stigma be taken as proof of a compound structure. Nees v. Esenbeck, however, describes the ovary as being really composed of 3 valvate carpellary leaves, with marginal placentæ. Berberids, another Order, with recurved anther-valves, seem far removed by their polypetalous flowers, hypogynous stamens, and copious albumen.

Trees, inhabiting cool places in the tropics of either hemisphere; in a very few instances only, straggling to the northward in North America and Europe. On the latter continent *Laurus nobilis* is the only species found in a wild state. Scarcely any species are known to exist on the continent of Africa. This is the more remarkable, as several species of *Laurus* have been found both in Teneriffe and Madeira, and others exist in Madagascar, and in the Isles of France and Bourbon.

The species of this extensive Order are in all cases more or less aromatic and fragrant; some are valuable for their timber, others bear fruits that partake of the quality of the Nutmeg, a certain number are useful febrifuges, and some yield a fixed as well as volatile oil, and an abundance of camphor. Foremost among them are Cinnamon and Cassia, two well-known spices brought to Europe from the hotter parts of Asia. According to Blume, the finest sort of Cinnamon is produced by the *Cinnamomum zeylanicum* of Nees; and Chinese Cassia-bark by *Cinnamomum Cassia* (*C. aromaticum*, Nees). But Dr. Wight has ascertained that Cassia-bark is really produced by several and perhaps nearly all the species of *Cinnamomum*.—*Hooker's Journal*, 2. 342. Culilawan bark, a very valuable product, with a taste of Cloves, is yielded by *Cinnamomum Culilawan*, and many more species of the same genus have been found to resemble Cinnamons in their peculiar qualities, especially *C. nitidum*, which is said to have furnished a part of the aromatic dried leaves once employed under the name of *Folia Malabathri*, *Tamalapathri* or *Indi*.—See Blume's *Rumphia*, the works of Dierbach, Geiger, Guibourt, and Pereira, and Endlicher's *Enchiridion*, for further information upon this subject. Many others have the quality of Cinnamon, although belonging to different genera. The Cinnamon of Santa Fé is produced by *Nectandra cinnamomoides*; of the Isle of France by *Oreodaphne cupularis*. The Clove Cassia of Brazil is the bark of *Dicypellium caryophyllatum*, which Martius terms "*Arbor omnium Laurinearum quas Brasilia alit nobilissima*." To these must be added Brazilian Sassafras (*Nectandra cymbarum*), Bois de Rose (*Licaria guianensis*), and the Casca preciosa of the Portuguese (*Mespilodaphne pretiosa*).

Among the timber trees must be mentioned the celebrated Greenheart of Demerara, whose wood is remarkable for its hardness, and which is the *Nectandra Rodiæi* of Schomburgk; the Siraballi of the same colony is a fragrant and valuable timber obtained from some species allied to *Oreodaphne*. A coarse Mahogany is obtained in Madeira from *Persea indica*, called Viñatico; the Sweet-wood of Jamaica, a hard yellow durable wood, belongs to *Oreodaphne exaltata*, and the Til of the Canaries, a sort of timber with an atrocious odour, bears the name of *Oreodaphne fetens*.

Of those with aromatic fruits there are the Pichurim Beans of commerce, which have been ascertained to be the cotyledons of *Nectandra Puchury*, and have the flavour of Nutmegs of inferior quality; the Camara, or Ackawai Nutmeg, produced by *Acroclidium Camara*, *Schomb.*, considered in Guiana to be one of the most efficacious remedies in colic, diarrhœa, and dysentery; Cujumary Beans, from *Ayden-dron Cujumary*, and Laurel. The Clove Nutmegs of Madagascar are gathered from *Agathophyllum aromaticum*, and Brazilian Nutmegs from *Cryptocarya moschata*.

Among febrifuges the Bibiri or Beebeeru of Guiana, *Nectandra Rodiæi*, claims a high rank: Dr. MacLagan has shown that sulphate of Beebeerim acts with rapid and complete success in arresting ague.—*Trans. R. S., Edinb.*, xv. The bark of *Caryodaphne densiflora* is brownish, tonic, and contains a great quantity of bitter, somewhat balsamic extractive matter; the leaves are gratefully aromatic; they are used in infusion, like tea, against spasms of the bowels, and the convulsive affections of pregnant women. Sassafras officinale, a large tree inhabiting the United States, has great reputation as a powerful sudorific, and, combined with Guaiacum and Sarsaparilla, in cutaneous affections, chronic rheumatism, and old syphilitic maladies. The dried leaves contain so much mucilage that they are used in Louisiana for thickening soup, like *Hibiscus esculentus*. The bark of the branches as well as the wood has been employed: but they are inferior to the bark of the root. In Sumatra the place of this tree is taken by another species, the Sassafras Parthenoxylon, called Oriental Sassafras. Benzoin odoriferum is another plant with similar qualities. Its bark is highly aromatic, stimulant and tonic; and is given in decoction or powder in intermittents. An infusion



of the twigs acts as a vermifuge; the oil of the berries, which are aromatic, is stimulant. These berries are said to have been used in the United States during the American war as a substitute for Allspice. *Laurus nobilis* has also aromatic berries, but they are chiefly used by confectioners. Among tatty matters may be mentioned that of *Tetranthera Roxburghii*, whose fruit yields a greasy exudation. It is a fruit of which is supposed to constitute the principal part of the fruit of *Passia guianensis*, so much esteemed in the West Indies under the name of the Avocado Pear. Camphor is by no means an uncommon secretion of these plants. It occurs abundantly in some species of *Cinnamomum*, especially in their roots, which are so much contaminated by it as to be unfit for use as a spice. The Camphor of commerce, however, or Chinese Camphor, is obtained in *Camphora officinarum* from the wood, branches and leaves, by means of dry distillation. It is a kind of Stearoptine remaining after the Elaeoptine or ethereal oil of the live tree is evaporated. *Nees*. It is chiefly produced in the island of Formosa, and brought by the Chinese junks in very large quantities to Canton, whence foreign markets are supplied. In some cases a volatile oil is obtained from the Laurels in large quantities; that of *Oreodaphne edifera*, a tree found in vast forests between the Orinoko and the Parana, is produced in great abundance by merely making an incision into the bark with an axe, as deep as the liber. It gushes out in such quantity, that several quarts may be obtained by a single incision. It has the reputation of being a powerful discutient. The fruit of this tree yields upon distillation a limpid volatile oil of a yellow wine-colour, an aromatic acrid taste, and smell as if old oil of Orange-peel had been mixed with oil of Rosemary. It is used in Brazil in contraindications of the joints, pains in the limbs, and similar cases, under the name of *Canella do Cheiro*.—*Martius*.

# GENERA.

<i>Cinnamomum</i> , Burm.	<i>Caryodaphne</i> , Blume.	<i>Elaphoglossa</i> , Swp.	<i>Cassipouira</i> , Presl.
<i>Malabathrum</i> , Burm.	<i>Anethophyllum</i> , Juss.	<i>Gouperria</i> , Nees.	<i>Cymodaphne</i> , Nees.
<i>Camphora</i> , Nees.	<i>Emmenanthe</i> , Gaertn.	<i>Hubbaldia</i> , Nees.	<i>Tetranthera</i> , Jacq.
<i>Apollonias</i> , Nees.	<i>Rousselia</i> , Sonner.	<i>Schlotheimia</i> , Nees.	<i>Limonium</i> , Linn.
<i>Plathe</i> , Nees.	<i>Mespilodaphne</i> , Nees.	<i>Oreodaphne</i> , Nees.	<i>Trachylophos</i> , Gaertn.
<i>Persea</i> , Gaertn.	<i>Aydonetron</i> , Nees & Mart.	<i>Amygdalopsis</i> , Nees.	<i>Berrua</i> , Klein.
<i>Eriodaphne</i> , Nees.	<i>Eryonanthodaphne</i> , Nees.	<i>Aurantiaphne</i> , Nees.	<i>Schinus</i> , Lour.
<i>Machilus</i> , Nees.	<i>Acrochordaphne</i> , Nees.	<i>Quercus</i> , Gaertn. f.	<i>Hymenocallis</i> , Linn.
<i>Boldu</i> , Blaud.	<i>Misantonon</i> , Schlotheim.	<i>Geompholoma</i> , Nees.	<i>Gonoloma</i> , Linn.
<i>Alseodaphne</i> , Nees.	<i>Nectandra</i> , Roth.	<i>Arctostaphylos</i> , Nees.	<i>Long</i> , Gaertn.
<i>Hufelandia</i> , Nees.	<i>Pimenta</i> , Nees.	<i>Umbellaria</i> , Nees.	<i>Polyscias</i> , Nees.
<i>Dehasia</i> , Burm.	<i>Persea</i> , Schreb.	<i>Metastadia</i> , Presl & Presl.	<i>Lindleya</i> , Presl.
<i>Hausia</i> , Blaud.	<i>Dielypium</i> , Nees.	<i>Lauraria</i> , Apple.	<i>Lomocarpus</i> , Nees.
<i>Endiandra</i> , R. Br.	<i>Elaphoglossa</i> , Aubl.	<i>Camphorosma</i> , Nees.	<i>Persea</i> , Nees.
<i>Horselundelia</i> , Nees.	<i>Petalotrichum</i> , Nees.	<i>Quercus</i> , Aubl.	<i>Acridaphne</i> , Nees.
<i>Cecidodaphne</i> , Nees.	<i>Phacelium</i> , Nees.	<i>Stachyophyllum</i> , Nees.	<i>Lygia</i> , Nees.
<i>Cryptocarya</i> , R. Br.	<i>Epilobium</i> , Nees.	<i>Schlotheimia</i> , Nees.	<i>Persea</i> , Nees.
<i>Pimenta</i> , Nees.	<i>Leptodaphne</i> , Nees.	<i>Gymnabulbus</i> , Nees.	<i>Persea</i> , Nees.
<i>Gonoloma</i> , Ruiz. et P.	<i>Apocynum</i> , Aubl.	<i>Sassafras</i> , Nees.	<i>Persea</i> , Nees.
<i>A. hirsutum</i> , Presl.	<i>Daphniphyllum</i> , Schreb.	<i>Benzoin</i> , Nees.	<i>Persea</i> , Nees.
<i>Kentia</i> , Meib.			

NUMBERS. GEN. 16. Sp. 450.

*Adrospaphne*, &c.

POSITION.—Thymelacæ.—LAURACEÆ.—Cassythacæ.

# ADDITIONAL GENERA

*Parthenoxylum*, B. near *Sassafras*.  
*Lindera*, Thunb. = *Benzoin*, Nees.  
*Nothaphne*, B. near *Plathe*.  
*Dictyodaphne*, B. near *Lindera*.  
*Dendasia*, B. near *Cryptocarya*.

*Cassipouira*, B. near *Persea*.  
*Itanaphne*, B. near *Persea*.  
*Apocynum*, B. near *Persea*.  
*Nectandra*, B. near *Persea*.



## ORDER CCVI. CASSYTHACEÆ.—DODDER-LAURELS.

Laurinæ, § Cassythæ, *Nees ab Esenb. Laurin. Expos.* 20. (1833).—Cassythæ, *Lindl. Nixus. Pl.* 15. (1833).—Cassythaceæ, *Ed. Pr.* (1836).

DIAGNOSIS.—*Daphnal Exogens, with anthers bursting by recurved valves, scales for leaves, and fruit buried in a succulent permanent calyx.*

These plants have quite the appearance of Dodders, and, like them, appear to live parasitically on other plants. They have no leaves properly so called, but scales appear here and there on their cord-like colourless twining stems. The general structure of their flowers is that of Laurels. The calyx is 6-parted, the 3 outer divisions being small and inconspicuous. The stamens are petaloid, twelve in number, in 4 rows; the two external rows are perfect, with 2-celled anthers, whose valves are recurved and turned inwards; the next row is very much smaller, and has a pair of glands at the base of each, while the valves of the anthers turn outwards; the fourth row is scale-like and abortive. The ovary is one-celled, and contains one ovule; it extends upwards into a short style with a simple stigma. The fruit is a nut, coated by the succulent, enlarged, and permanent calyx; it contains a single seed without albumen, an embryo with plano-convex cotyledons, and an inclosed superior radicle.

The structure, then, is nearly that of Laurels, the main difference consisting in the fruit being inclosed in a berried calyx. I formerly supposed that more valid distinctions existed, having been misled by a description given by Nees v. Esenbeck. Mr. Gardner has, however, shown that this was very erroneous (*Hooker's Journal*, 2. 26), and he entertains no doubt about the identity of Laurels and Dodder-Laurels. It seems to me, however, better to keep them distinct until some connecting link shall have been discovered, if there be such a thing.

The species are found in the hottest parts of the world.

Nothing is known of their uses.

## GENUS.

*Cassythia*, L.  
*Volutella*, Forsk  
*Calodium*, Lour.

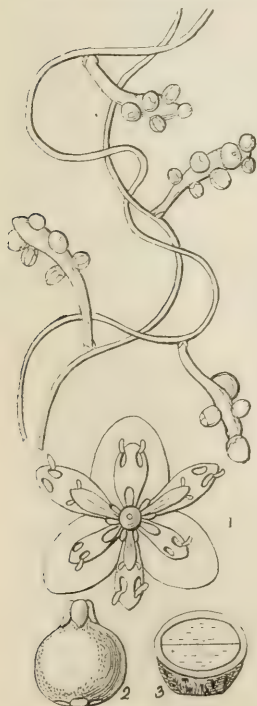


Fig. CCCLXVII.

NUMBERS. GEN. 1. Sp. 9.

*Cuscutaceæ?*

POSITION.—Lauraceæ.—CASSYTHACEÆ.

Fig. CCCLXVII.—*Cassythia filiformis*. 1. a flower; 2. a fruit; 3. a section of it transversely.

(See *Ann. des Sc. Nat.*, 3 ser., V. 247.)



## ALLIANCE XLII. ROSALES.—THE ROSAL ALLIANCE.

DIAGNOSIS.—*Perigynous flowers, with numerous stamens forming a distinct cup, axillary or basal placentæ, definite seeds, corolla, if present, polypetalous, and an axillary embryo with little or no allamen.*

The sequence of affinities seems to be broken when Daphnals are stationed next Rosals; but if Calycanthus are regarded as the equivalent among Rosals of Plum Nutmegs among Monispermals, the transition is not so violent; for the relation of Laurels to Plum Nutmegs is usually admitted, and therefore their affinity to Calycanthus must also be conceded. In fact, in Calycanthus we have the apetalous structure and aromatic qualities of Laurels combined with the peculiar characters of Roseworts.

The Rosal Alliance is in many instances known by its indefinite stamens, but that character is not found in any large number of Leguminous plants, and is departed from even among Roseworts themselves. Their apocarpous fruit, small number of seeds, and amygdaloid embryo, are better characteristics. The obliquity of the carpels will in all instances show that those organs are simple, and a part of a system of separation, not consolidation, and by this circumstance Roseworts are clearly known from Daphnals, in which the fruit, although simple in appearance, has probably a compound structure.

Rosals touch Ficoidals by Sanguisorbs, and Saxifragals by Roseworts themselves; but the genera of the latter have not infrequently been confounded by even good Botanists with those of Saxifragæ. The small embryo and allamen of the latter offer, however, a clear mark of distinction.

## NATURAL ORDERS OF ROSALS.

<i>Flowers consisting of numerous imbricated anthers. Calyxes</i>	} 207. CALYCANTHACEÆ
<i>cuneolate.</i>	
<i>Flowers polypetalous (or apetalous), rarely in quads, regular.</i>	} 208. CHRYSOCLADACEÆ
<i>Carpel solitary. Style proceeding from the base of the</i>	
<i>carpel.</i>	} 209. FARGESÆÆ
<i>Flowers polypetalous (or apetalous), repartitionous or fringed.</i>	
<i>inuous. Carpel solitary, with the style proceeding from</i>	} 210. DAPHNOIDEÆ
<i>the apex of the ovary.</i>	
<i>Flowers polypetalous, regular, dropaceous. Carpel solitary,</i>	} 211. ROSACEÆ
<i>with the style proceeding from the apex of the ovary.</i>	
<i>Flowers polypetalous, regular. Carpels adhering to the ovary</i>	} 212. SAXIFRAGACEÆ
<i>by their back.</i>	
<i>Flowers apetalous. Carpel solitary, enclosed in a tubular</i>	} 213. ROSACEÆ
<i>calyx-tube forming a false pericarp.</i>	
<i>Flowers polypetalous. Carpels free from the calyx, and quite</i>	} 214. ROSACEÆ
<i>or nearly so from each other.</i>	



## ORDER CCVII. CALYCANTHACEÆ.—CALYCANTHS.

*Calycanthaceæ*, Lindl. in *Bot. Rep.* fol. 404. (1819); DC. *Prodr.* 3. 1.; Endl. *Gen.* cclxxi: Meisner *Gen.* p. 106.—*Calycanthinæ*, Link. *Enum.* 2. 66. (1822).

DIAGNOSIS.—*Rosal Exogens*, whose flowers consist of numerous imbricated scales, and have convolute cotyledons.

Shrubs, with square stems, having 4 woody imperfect axes, surrounding the central ordinary one. Leaves opposite, simple, scabrous, without stipules. Flowers axillary, solitary. Sepals and petals confounded, indefinite, imbricated, combined in a fleshy tube. Stamens

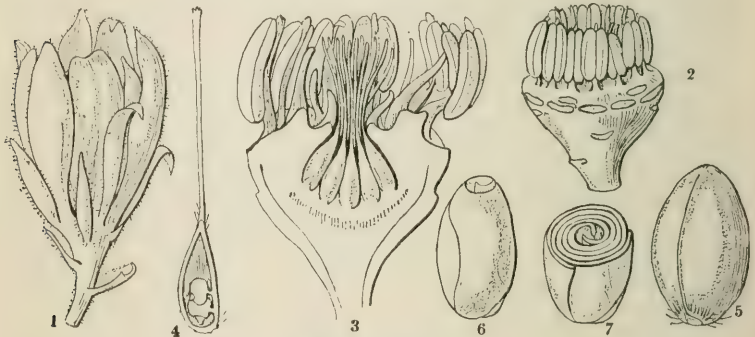


Fig. CCCLXVIII.

indefinite, inserted in a fleshy rim at the mouth of the tube, the inner sterile; anthers aduate, turned outwards. Ovaries several, simple, 1-celled, with one terminal style, adhering to the inside of the tube of the calyx. Ovules anatropal, solitary, or sometimes 2, of which one is abortive, ascending. Nuts inclosed in the fleshy tube of the calyx, 1-seeded, indehiscent. Seed ascending; albumen none; cotyledons convolute, with their face next the axis; radicle inferior.

Jussieu originally placed this Order at the end of Roseworts; he subsequently referred it to Monimiads; and I afterwards formed it into a particular family. With Monimiads it is less nearly related than it appears to be, the principal points of resemblance being the collection of several nuts within a fleshy calyx in both Orders; for Calycanthus can scarcely be considered apetalous, as some Monimiads are, on account of the obvious petals of *Chimonanthus*. The imbricated sepals, in *Calycanthus* chocolate-coloured and becoming confounded with the petals, the fragrance of the flowers, and the plurality of ovaries, seem to indicate an affinity with Magnoliads, and especially with *Illicium*; but the decidedly perigynous stamens and fleshy calyx inclosing the ovaries in its tube, the highly developed embryo, and want of albumen, are great objections to such an approximation. Myrobalans agree in having an exalbuminous embryo, with convolute cotyledons; but with this their resemblance ceases. Myrtleblooms also agree in this same particular, in the case of *Punica*; and their opposite leaves, without stipules, and frequent fragrance, strengthen the affinity indicated by the embryo. Roseworts, however, to which Jussieu originally referred *Calycanthus*, agree much more nearly in the perigynous insertion of their stamens, in the peculiar structure of their calyx, the tube of which in the Rose is entirely analogous to that of *Calycanthus*, in the superposition of their ovules when two are present, and in the high development of their exalbuminous embryo; upon the whole, therefore, no Order appears to have so much affinity with *Calycanthus* as Roseworts; and the sagacity of Jussieu, in originally referring *Calycanthus* to that Order, is completely confirmed by the discovery recently made by Lowe, that the cotyledons of *Chamæmeles*, a genus of Appleworts, are convolute. This, I think, fixes the station of *Calycanthus* in the neighbourhood of Roseworts, from which they are distinguished by the imbricated sepals, and the anthers, partly

Fig. CCCLXVIII.—*Calycanthus floridus*. 1. a flower; 2. the same without the sepals and petals; 3. a perpendicular section of the last; 4. a section of an ovary; 5. a nut; 6. an embryo; 7. a transverse section of it.



fertile and partly sterile, being turned outwards. This Order is also characterized by the singular structure of the wood, a peculiarity originally remarked by Murchison in some species, and which I have since ascertained to exist in all. In the stems of these plants there is the usual deposit of concentric circles of wood around the pith, and in addition four very imperfect centres of deposition on the outside next the bark, a very unusual structure. A good figure of this interesting fact has been given by Muhl. in the *Annales des Sciences Naturelles*, vol. 14. p. 367. It must be also added that the woody tissue of this Order exhibits disks extremely like those of Conifers.

Natives of North America and Japan.

The aromatic fragrance of the flowers is their well-known quality. It appears that this also exists in their bark, which is consequently employed, in the case of *C. floridus*, as a substitute for Cinnamon in the United States.

#### GENERA.

*Calycanthus*, L.  
*Endlicheria*, Endl.  
*Banisteria*, Forst.  
*Plectranthus*, Ait.  
*Pongapongia*, Benth.  
*Chimonanthus*, Less.  
*Meriania*, Nees.

NUMBERS. GEN. 2. Sp. 6.

*Magnoliaceæ*.

POSITION.—ROSACEÆ. CALYCANTHACEÆ.—POMACEÆ.

*Myrtaceæ*.



## ORDER CCVIII. CHRYSOBALANACEÆ.—CHRYSOBALANS.

Chrysobalanææ, R. Brown, in *Tuckey's Voyage to the Congo*, App. (1818); DC. *Prodr.* 2. 525. a § of Rosacæ; Barth. *Ord. Nat.* p. 405; Endl. *Gen.* cclxxiv; Meisner *Gen.* p. 101.

DIAGNOSIS.—*Rosal Exogens*, with polypetalous or apetalous flowers, which are nearly or quite regular, a solitary carpel, and a style proceeding from its base.

Trees or shrubs. Leaves simple, alternate, stipulate, with no glands, and veins that run parallel with each other from the midrib to the margin. Flowers in racemes, or

panicles, or corymbs. Calyx 5-lobed, sometimes unequal at the base, with an imbricated æstivation. Petals with short stalks, more or less irregular, either 5 or none. Stamens either definite or 00, usually irregular either in size or position. Ovary superior, consisting of a single carpel, 1- or 2-celled, cohering more or less on one side with the calyx; ovules twin, erect, anatropal; style single, arising from the base; stigma simple. Fruit a drupe of 1 or 2 cells. Seed erect. Embryo with fleshy cotyledons, and no albumen.

The obvious affinity of this Order is with Almondworts, from which it differs in having irregular stamens and petals, and a style proceeding from the base of the ovary. With Roseworts, to which Chrysobalans have a strict relation, they agree in the same manner as Almondworts, excepting the characters just pointed out. To leguminous plants, with drupaceous fruit, they approach closely in the irregularity of their stamens and corolla, and especially



Fig. CCCLXIX

in the cohesion which takes place between the stalk of the ovary and the sides of the calyx; a character found, as De Candolle well remarks, in *Jonesia* and *Bauhinia*, undoubted leguminous plants: Chrysobalans are distinguished from this latter Order by the position of their style and ovules, and by the relation which is borne to the axis of inflorescence by the odd lobe of the calyx being the same as occurs in Roseworts. Brown remarks that the greater part of the Order has the flowers more or less irregular, and that the simple ovary of *Parinarium* has a dissepiment in some degree analogous to the moveable dissepiment of *Banksia* and *Dryandra*; but we now know, from the more recent observations of this learned Botanist upon the ovule, that the dissepiment of Proteads arises differently. The analogy of structure, as to the dissepiment of *Parinarium*, is to be sought in *Amelanchier*.

Chrysobalans are principally found in the tropical regions of Africa and America; none are recorded as natives of Asia; but there is reason to believe, from specimens of large trees seen in the forests of India, without flowers or fruit, by Wallich, that one or two species of *Parinarium* are indigenous in equinoctial Asia; and Royle's genus *Prinsepia*, founded upon a spiny plant from Nipal, is apparently referable to this Order. One species of *Chrysobalanus* is found as far to the north as the pine-barrens of Georgia in North America; a climate, however, as in all the regions bounding the Gulf of Mexico on the north, much more heated than that of most other countries in the same parallel of latitude.

Many of these are what in Europe are called Stone-fruits. *Moquilea grandiflora* yields eatable drupes in Brazil. The fruit of *Chrysobalanus Icaco* is eaten in the West

Fig. CCCLXIX.—*Moquilea canomensis*.—Martius. 1. a flower; 2. an ovary; 3. a perpendicular section of the last; 4. a fruit; 5. a kernel.



Indies, under the name of *Coccolophum*; another is brought to market as *Caraca* (C. luteus); and the Rough-skinned, or Grey plant of the same country is the product of *Parinarium exelsum*. The kernel of *Parinarium macrocarpum* and *macrocarpum* is said by Aublet to be sweet and good to eat. The seeds of *Leptocarpus nitidus* yield by expression a useful oil.—*Roth*. The root, bark, and leaves of *Chrysobalanus* have been prescribed in Brazil against diarrhoea, leucorrhœa, and similar ailments.—*Martius*.

## GENERA.

<i>Chrysobalanus</i> , Lam.	<i>Hedyscyma</i> , Seeb.	<i>Leptocarpus</i> , Mill.	<i>Parinarium</i> , Swartz.
<i>Caraca</i> , Poir.	<i>Leptocarpus</i> , Benth.	<i>Spina</i> , Ait.	<i>Parinarium</i> , Swartz.
<i>Hirtella</i> , Lam.	<i>Leptocarpus</i> , Benth.	<i>Parinarium</i> , Swartz.	<i>Parinarium</i> , Swartz.
<i>Coccolophum</i> , Ruizet P.	<i>Leptocarpus</i> , Benth.	<i>Parinarium</i> , Swartz.	<i>Parinarium</i> , Swartz.
<i>Coccolophum</i> , Sw.	<i>Leptocarpus</i> , Benth.	<i>Parinarium</i> , Swartz.	<i>Parinarium</i> , Swartz.
<i>Leptocarpus</i> , Desv.	<i>Leptocarpus</i> , Benth.	<i>Parinarium</i> , Swartz.	<i>Parinarium</i> , Swartz.
<i>Leptocarpus</i> , Pl. M.	<i>Leptocarpus</i> , Benth.	<i>Parinarium</i> , Swartz.	<i>Parinarium</i> , Swartz.
<i>Leptocarpus</i> , Mill.	<i>Leptocarpus</i> , Benth.	<i>Parinarium</i> , Swartz.	<i>Parinarium</i> , Swartz.

NUMBERS. GEN. II. Sp. 50.

POSITION.—FALCACEÆ.—CHRYSOBALANACEÆ.—DRUPACEÆ.

## ADDITIONAL GENUS.

*Chrysobalanus*, Lam. 1797. *Chrysobalanus*.



## ORDER CCIX. FABACEÆ.—LEGUMINOUS PLANTS.

Leguminosæ, *Juss. Gen.* 345. (1789); *Bronn. Diss.* (1822); *Prodr.* 2. 93; *Walpers in Linnæa*, xiii. *Endl. Gen.* p. 1253.; *Meisn. Gen.* p. 84.

DIAGNOSIS.—*Rosal Exogens*, with polypetalous or apetalous flowers, a papilionaceous corolla or a leguminous fruit, and a solitary carpel whose style proceeds from the apex.

Herbaceous plants, shrubs, or vast trees, extremely variable in appearance. Leaves



Fig. CCCLXX.

alternate, most commonly compound, occasionally marked with transparent dots; petiole tumid at the base. Stipules 2 at the base of the petiole, and 2 at the base of each leaflet. Pedicels usually articulated, with 2 bractlets under the flower. Calyx 5-parted, toothed or cleft, inferior, with the odd segment anterior; the segments often unequal, and variously combined. Petals 5, or by abortion 4, 3, 2, 1, or none, inserted into the base of the calyx, either papilionaceous or regularly spreading; the odd petal, if any, posterior. Stamens definite or indefinite, perigynous, rarely hypogynous, either distinct or monadelphous, or diadelphous; very rarely triadelphous; anthers versatile. Pistil simple, superior, 1-celled, 1- or many-seeded, commonly consisting of a single carpel, but occasionally of 2, or even of 5; style simple, proceeding from the upper margin; stigma simple. Fruit either a legume or a drupe. Seeds attached to the upper suture, solitary or several, occasionally with an aril; embryo with or without albumen, either straight or with the radicle bent upon the cotyledons; cotyledons either remaining under ground in germination, or elevated above the ground, and becoming green like leaves, always very large in proportion to the radicle, and very often amygdaloid.

The most common feature of Leguminous plants is to have what are called papilionaceous flowers; and when these exist, no difficulty is experienced in recognising them, for papilionaceous flowers are found nowhere else. Another character is to have a leguminous fruit; and by one of these two characters all the plants of the Order are known. It is remarkable, however, that one or other of these distinctions disappears in a great many cases. *Cæsalpinieæ* have an irregular flower, with spreading petals and stamens adhering to the calyx; others have no petals at all, or some number less than five; while *Mimoseæ* have perfectly regular flowers and indefinite hypogynous stamens. *Detarium*, *Dipteryx*, and others, instead of a legume, bear a fruit not distinguishable from a drupe. This last circumstance is easily to be understood, if we bear in mind that a legume and a drupe differ more in name than reality, the latter being formed upon precisely the same plan as the former, but with this modification, that its pericarp is thickened, more or less fleshy on the outside and stony on the inside, 1-seeded, and indehiscent. Hence some of the

Fig. CCCLXX.—*Adenocarpus frankenioides*. 1. the standard, wings, and keel split open; 2. the stamens; 3. a cross section of a seed; 4. a legume, with a portion of one of the valves turned back.



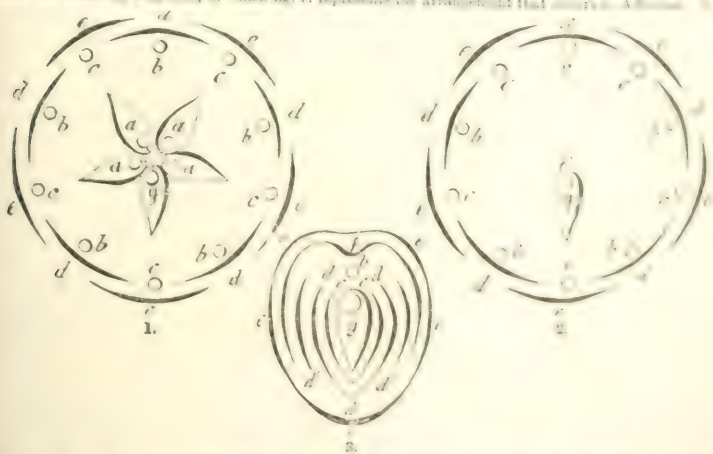
regular flowered genera with distinct stamens may be added to the *Hæmorrhæoidæ*, *Strophæ*, and *Leguminosæ* in fruit. Simple, therefore, as the discussion of this Order usually is, Thunberg is perfectly correct in asserting that, until he indicated the difference of the position of the odd lobe of the calyx in *Leguminosæ* plants, but *Rosa* etc., no positive character had been discovered to distinguish the one Order from the other.

Very few double flowers are known in this Order; those of *Spergularia*, *Linum*, and *Ulex europæus* are the most remarkable; the nature of the latter I have mentioned in detail in the *Transactions of the Hort. Soc.* vol. 7, p. 247. Two genera are mentioned *Wimmeria sinensis*; and the same phenomenon is to be seen, according to De Cusselle, in *Cardiophora discifolia*; it appears also to be normal in *Diplazium* and *Casipollia* (Lam.). *Androsæthe* Hillebrand is said (*Hill. Mem.* 59) to have found a *Thunbergia* in Brazil with a corolla. On account of these and other circumstances, De Cusselle assumes the supposition of *Leguminosæ* plants to be solitary by abortion, and that a whorl of 6 is that which is necessary to complete the symmetry of the flowers. Of the accuracy of this view I am completely and it might have been proved from analogy, without the aid of such instances.

In consequence of the highly irritable nature of the leaves of many of the plants of this Order, and of the tendency to irritability discoverable in them all, some Botanists have placed them at the extremity of their system, in contact with the terms of the animal kingdom. See *Agardh, Chæmo*, p. 4, and *Martens H. B. M.* p. 179. For observations upon the nature of this irritability, see *DeCusselle and De Micheli, Trans.* 1828, 39 which the author endeavours to show that the motion is the effect of galvanic agency; and the same writer's *Nouvelles Recherches sur l'Electricité*, &c. in which he offers the explanation of the manner in which galvanism produces the motion, adhering, however, to his opinion of that subtle principle being the real agent. To me, however, it appears more satisfactory to attribute the phenomenon to an inherent vital motion, without ascribing it after first causes, which it is impossible, from the nature of things, to investigate.

In many respects this Order is one of the most important with the Botanist for study; more especially as it serves to show how little real importance ought to be attached to delucence of fruit in determining the limits of Natural Orders. What may be called the normal fruit of *Leguminosæ* plants is a legume, that is to say, a dry simple carpel, with a suture running along both its margins, so that at maturity it separates through the line of each suture into two valves; but every conceivable degree of deviation from this type occurs: *Arachis* and many more are indehiscent; in *Carmichaelia* the valves separate from the suture, which remains entire, like the replum of Crucifers; in all *Lomentaceæ* genera, such as *Ononis*, the valves are indehiscent in the line of the suture, but separate transversely; in *Lathyrus* a combination of the peculiarities of *Carmichaelia* and *Lomentaceæ* occurs; in *Hæmorrhæoidæ* the valves

\* The plan of what must be regarded as the normal form of *Leguminosæ* flowers, and is given from the following diagrams, in which fig. 1. represents the attachment that occurs in *A. sinensis*.



theory of the ordinary papilionaceous condition; and 3. the longitudinal section of a flower. In fig. 1. and 2. a are the sepals; d the petals; b, c, e, f, g, h, i, j the stamens; a the ovary. In fig. 3. a is the ovary; b the petals; c, d, e, f, g, h, i, j the stamens. These are taken from a paper by Wimperley, in the *Ann. Bot. Soc.* 1841.







Brazil-wood, Logwood, and Rosewoods of commerce; the Laburnum, the common *Vicia*; the Furze and the Green, both the pride of the extensive daisy heaths of Europe; the Bean, the Pea, the Vetch, the Clover, the Trefoil, and Guernsey, all various articles of culture by the farmer, are so many Leguminous species. The Ostracod and Senegal, Kino, Senna, Fragranth, and various other dyes, not to mention Indigo, the most useful of all dyes, are products of other species; and there may be given as a general indication of the purposes to which Leguminous plants may be applied. There is this, however, to be borne in mind, in regarding the qualification of an Order to a particular point of view; viz., that upon the whole it must be considered pernicious. And that those species which are used for food by man or animals are distinguished by the general rule: the deleterious juices of the Order not being in such quantities sufficiently concentrated to prove injurious, and being, in fact, replaced in a considerable extent by either sugar or starch. This will become more apparent from the demand account which now follows.

#### PAPILIONACEÆ.

It is in this part of the Order that we principally find species with nutritious, or at least wholesome qualities: thus Clover, Medick, Laburnum, Trefoil, &c., are well-known fodder plants, as are also Saintfoin, Ornithopus or Serradilla, various Astragal, Ononis juncea, Desmodium diffusum, Indigofera enneaphylla, &c., in different parts of the world.

The seeds of many are common articles of food, under the name of Pulse. Of these the most remarkable is the *Arachis hypogæa*, or under-ground Kidney-bean, whose pods are forced into the ground after the flowering has been accomplished. This and the *Vicia sativa* are very largely cultivated by the African negroes, who call the *Arachis*, Munduli. The seeds contain a very large quantity of oil. More common kinds of pulse are Peas, Beans, Lentils, Pigeon-peas (*Cajanus*), the seeds of various species of *Dolichos*, *Phaseolus*, &c. It is, however, to be remarked, that they are often very unwholesome; the roots of *Phaseolus* are dangerously narcotic, as will be seen hereafter. The ripe seeds of *Lathyrus Aphaca*, called by the French *Vesce cultivée*, are narcotic and produce excessive headache, but when green they are eaten without inconvenience; and Christison tells us that flour in which the seeds of *Lathyrus Cicera* have been ground up is poisonous. Beans themselves cannot be given to horses in much quantity without bad effects.—Of nutritious or wholesome qualities in other parts we have several useful instances. The roots of the *Laportea* (*Glycyrrhiza glabra*) contain an abundance of a sweet mucilaginous juice, which is much esteemed as a pectoral, but it is sub-aerial; similar qualities are ascribed to *Trifolium alpinum* roots, and those of *Glycyrrhiza echinata* and glandulifera. The roots of *Alchemilla* possess exactly the properties of the *Laportea* root of the same. In some they are found demulcent. Those of *Dolichos tuberosus* and bulbosus, *Astragalus*, *Psoralea*, and *Lathyrus tuberosus*, are wholesome food. A kind of Manna is produced by species of *Camel's-thorn*, related to *Albizia* *Maurum*. It is remarkable that this substance is not formed in India, Arabia, or Egypt; emanates like those of Persia and Barbary, growing alone suited for its production. It is the *Toring jalmoo* of the Arabs, and is gathered by merely shaking the branches. Such is the importance of this plant as a food to cattle that the Afghans, who call it *Kari-shutur*, or *Jamsa*, believe that the medicinal use of those animals, experienced in the Afghan operations, arose from the use of this plant. Some writers are of opinion that this was the Manna on which the children of Israel were fed in the wilderness. A sweet quality is also found in *Wisteria glycyphyllus* and other species of that genus, in *Saintfoin* (*Ononis juncea*), in the leaves, root, and inner bark of *Robinia Pseudacacia*.

Well-marked purgative properties occur in *Colutea arborescens* (Bladder Tree), whose leaves are used for adulterating the blunt-leaved *Senna* of the druggists; *Ononis* *juncea* (Scorpion Senna), and *C. varia*, which last is very poisonous; as well as in certain species of *Genista*, *Cytisus*, *Robinia*, *Cilicaria*, *Amygdalus*, &c. A decoction of the young tops of *Cytisus scoparius* (Broom) is a powerful emetic; the seeds are said to be emetic; Mead and Cullen found them useful in dyspepsia. *Tephrosia purpurea* is used as a purgative by the people of Popayan.

Many are tonics and astringents. The bark of *Acythos grandifolius* is exceedingly astringent and tonic. The root of *Ormoscapum seminales* is considered to be tonic and astringent. The root and seeds of *Sophora tomentosa* have been employed as specific in bilious sickness. African Kino is the produce of *Phoradendron africanum*. The Bala has proved that East Indian Kino is formed by *Phoradendron malabaricum*. *Quercus* *Præcox*



Fig. CCCLXXII.



and Red Sandal-wood belong to *Pterocarpus Draco* and *Santalinus*, Gum Lac to *Erythrina monosperma*. The *Dalbergia monetaria* of Linnæus yields a resin very similar to Dragon's-blood. A similar juice is yielded by *Butea frondosa* and *superba*, hardening upon their branches into beautiful ruby-coloured astringent masses, called Gum Butea, and used by the natives of North-western India for precipitating their Indigo, and in tanning; English tanners, however, object to its use on account of the colour which it communicates to leather. *Euchresta Horsfieldia* is regarded by the Javanese as a specific against the poison of venomous animals, or even such as is taken into the stomach; it is supposed to act as an emetic, in large doses.—*Horsfield*. The pods are sold, according to Leschenault, for 5 or even as much as 10 sous French money each. The seed of *Psoralea corylifolia* is considered by the native practitioners of India stomachic and deobstruent. A strong infusion of the root of *Mucuna pruriens*, sweetened with honey, is used by the native practitioners of India in cases of cholera morbus. A decoction of the bitter root of *Tephrosia purpurea* is prescribed by the Indian doctors against dyspepsia, lenteria, and tympanitis. The powdered leaf of *Indigofera Anil* is used in hepatitis. The leaves of the *Phaseolus trilobus* (called Sem, or Simbi) are considered by the Indian practitioners cooling, sedative, antibilious, and tonic, and useful as an application to weak eyes. The roots and herbage of *Baptisia tinctoria* have been found to possess antiseptic and sub-astringent properties. They have also a cathartic and emetic effect. This emetic quality is also possessed by others. The root of *Clitoria Ternatea* is so, and similar properties will be found to exist among the tribe *Mimoseæ*.

Others are diuretics, as the roots of Beans, Genistas, Ononis, and *Anthyllis Hermanniæ*.

A few produce gum; *Tragacanth* is yielded by *Astragalus verus* and similar spiny species; *A. creticus* (*πορριον*, *Diosc.*) and *A. aristatus* (*τραγακανθα*, *Diosc.*) furnish it in Greece, *A. gummifer* on Mount Lebanon and in Koordistan, and *A. strobiliferus* in the latter country.—*Bot. Reg.* 1840, *Misc.* p. 38.

Among dyes are Indigo, produced from various species of *Indigofera*, especially *tinctoria* and *cærulea*, which last is particularly extolled by Roxburgh for its excellence. In Nubia, *Tephrosia Apollinea* furnishes it, and in the countries bordering on the Niger *T. toxicaria* or some allied species.—*Gard. Chron.* 1842, p. 640. The flowers of *Butea frondosa* and *superba* discharge a beautiful yellow or orange dye, *Styphnolobium* (*Sophora*) *japonicum* yields the same colour from the austere pulp of its pods. *Baptisia tinctoria* produces Indigo of indifferent quality. *Genista tinctoria* affords a good yellow colour, and with woad a good green. Ray says the milk of cows feeding upon it is rendered bitter, which flavour is communicated to butter and cheese.

Several produce excellent timber. The *Robinia Pseudacacia* or Locust tree is hard and durable; *Laburnum* wood is light olive green, beautifully grained. The fragrant Rosewood, or Bois de Palixandre, of the cabinet-makers, has been ascertained to belong to 2 or 3 species of Brazilian *Triptolomeas*, and not to a *Physocalymma*, or *Mimosa*, as has been reported. *Pterocarpus dalbergiodes*, and several species of *Dalbergia*, especially *D. Sissoo*, are remarkable in India for the excellence of their wood. The Itaka wood of Guiana, remarkable for its black and brown streaks, on which account it is employed in cabinet work, is produced by *Machærium Schomburgkii*.

In a very large number of species narcotic properties have been recognised. The seeds of *Lathyrus Aphaca* have been already mentioned. Those of *Abrus precatorius*, whose scarlet seeds, with a black scar, are commonly used as beads, *Anagyris foetida*, and others, have a similar property. This, however, is positively denied, in the case of *Abrus*, by Dr. Macfadgen, who asserts them to be harmless, and merely indigestible. The leaves of *Arthrobium scorpioides* are capable of being employed as vesicatories. The juice of *Coronilla varia* is poisonous. The roots of *Phaseolus radiatus* are narcotic, and so are those of *P. multiflorus*, the Scarlet Running Kidney-bean, which is recorded to have poisoned some children at Chelsea, who had partaken of them. Both the *Laburnums* (*Cytisus alpinus* and *Laburnum*) have caused serious accidents to children who have swallowed their venomous seeds: and *C. Weldenii* is reported to poison the milk of the Dalmatian goats that browse upon its foliage. The dye called Indigo is a formidable vegetable poison. Schomburgk states that the violet blossoms of *Sabinea florida* are dangerous. The seeds of *Ervum Ervilia*, the Bitter Vetch, mixed with flour and made into bread, produce weakness of the extremities, especially of the limbs, and render horses almost paralytic. *Andira inermis* and *retusa*, and some *Geoffræas*, especially *G. vermifuga* and *spinulosa*, have an anthelmintic bark, with a disagreeable smell and a sweet mucilaginous taste; the effects are drastic, emetic, purgative, and narcotic; poisonous in large doses, producing violent vomiting with fever and delirium. A few years since, hundreds of sheep perished in the Swan River Colony, in consequence of their cropping the leaves of some plant wild there; according to an official report, it



was a *Burtonia* that produced the mischief (*ward, chron.*); but according to Mr. J. Drummond the mischief was caused by a *Goniodontium*.—*Pharm. Journ.* Jan. 1. 48. Nothing, however, more plainly indicates the vegetable nature of the poisons than their being used as fish poisons. The bark of the root of *Pongia* Lophura, a common Jamaica tree, is a very usual fish poison in Jamaica, and yields a most remarkable narcotic and diaphoretic tincture. Many *Tephrosias* are employed in the same way, especially *T. toxicaria*, the young branches of which, with the leaves pounded, and sometimes mixed with quick lime, are thrown into a pool of warm mountain stream, and have an almost immediate effect. The fish are observed to become agitated, and as it were intoxicated, and to rise to the surface, floating there with their heads upward, so as to be readily taken by the hand. It has been remarked that the fishes only recover gradually from the effects of the poison, but that the young fry perish. It has been suggested that the action of the plant upon the human system would resemble that of *Digitalis*, and might prove, in a climate where that plant does not grow, a desirable substitute.

In addition to all these uses, there is a long catalogue of species employed for miscellaneous purposes. *Crotalaria juncea* (Sun, Shunam, Taag, Bengal Hemp) furnishes a coarse fibre called Bengal Hemp, from which bags and low priced canvas is largely prepared in India. The volatile oil of *Dipteris odorata*, or Tonda Bean, a fragrant weed used by the perfumers and makers of snuff, has been ascertained to contain a powerful principle called Coumarin. It may be found in a crystallised state between the skin and the kernel, and exists abundantly in the flowers of *Medicago officinalis* and *vernica*, the latter of which gives its peculiar odour to the Chag ziger cheese in Switzerland, and is said to possess styptic properties, and to have relieved cases of bloody urine from several contusions. It is also employed in the preparation of an oily remedy for bruises.—*Pharm. Journ.* 2. 126. A decoction of the root of *Indigofera tinctoria*, used as a lotion, effectually destroys vermin; the juice of the young branches mixed with honey is recommended for aphthae of the mouth in children; and Indigo in powder, sprinkled on foul ulcers, is said to cleanse them. The disease in poultry, known in the West Indies by the name of yaws, is cured by the application of a solution of Indigo by means of a rag.—*Magdalen. Fl. Journ.* 1. 254. Indigo is also used in epilepsy and erysipelas.—*Med. Gaz.* xx. 172. The hairs of the pods of *Mucuna pruriens*, &c., constitute the substance called Cowitch, a mechanical anticholeric. The seeds of *Astragalus hortensis* are employed in Germany as a substitute for Cudbe. A good many species are emollient. The leaves of *Sesbania picta* are highly esteemed among the Hindoos, on account of the virtues they are said to possess in hastening suppuration when applied in the form of a poultice, that is, simply made warm, and mixed with a little castor oil. The root of *Pueraria tuberosa* peeled and bruised into a poultice is employed by the natives of the mountains where it grows to relieve swellings of the joints. A decoction of *Melilot* is emollient, and is occasionally used in the Continent in lotions and enemas. A decoction of the seeds of *Trigonotis Foeniculi-græcum* (Foenicreek) is used as an emollient, and poultices are made with their flour, but only used in veterinary medicine.

#### CESALPINIÆ.

Purgative properties are the great character of this Sub-order. Senna is almost every remarkable product. The Senna of the shops consists, according to DeCade, of *Cassia acutifolia*, *Cassia Senna*, and *Cynanchum Argel*. He says the *Cassia lanceolata* of Arabia does not yield the Senna of commerce, but this statement is at variance with the positive testimony of Forskhal. For the various qualities of Senna, the reader is referred to the *Flora Medica* and other works in which the subject is treated specially; it will there be found that many species yield this useful drug, which, according to Felton (*Pharm. Journ.* 3. 534, 5), is not an Egyptian product, as is usually supposed, but is obtained the Alexandrian supply coming from Dongola. Purgative properties are found in the fruit of *Cathartocarpus Fistula* and *Ceratonia Siliqua*, and also of the Tamarind, the preserved pulp of which is so well known as a delicious confection, and as the famous *Tamariciana pulcherrima*.—*Martius*. Many cases of catarrh of the fruit occur in this part of the Order. *Dialium indicum*, also called the Tamarind Plum, has a pul. formed with a delicate agreeable pulp, much less acid than the Tamarind. Two *Cassias* are called Brown and Velvet Tamarinds in Sierra Leone. *Ceratonia Siliqua*, under the name of the Carob-tree, or Algaroba-bean, is consumed in the south of Spain by humans, and has been imported into this country, it is said with profit, as a substitute for rhubarb. The dry pulp in which the seeds are buried is very nutritious, and is supposed to have been the food of St. John in the wilderness, wherefore it is called *Leasee tree*, and St. John's Bread. Singers are said to chew this fruit for the purpose of improving their voices.—*Pharm. Journ.* 3. 79. The seeds of the Carob-tree are said to have been the original



Carat weights of the jewellers. A similar fruit is borne by *Gleditschia triacantha*, called in North America the Honey Locust. In the pods of *Hymenæa Courbaril*, the



Fig. CCCLXXIII.

West Indian Locust-tree, there is a mealy substance in which the seeds are embedded, sweet and pleasant, but apt to purge when recently gathered; it loses this property as it becomes old. A decoction of the pulp, allowed to ferment, forms an intoxicating drink resembling beer. The succulent drupes of *Detarium microcarpum* are said to be agreeable to the palate of the Negroes. Some are reported to produce powerfully bitter and tonic effects. The bark and seeds of *Guilandina Bonduc* are of this class; the latter are very bitter; when pounded small and mixed with castor oil, they form a valuable external application in incipient hydrocele; the leaves are a valuable discutient, fried with a little castor oil, in cases of *hernia humoralis*. *Bowdichia major*, the roots of *Poinciana pulcherrima*, the wood of *Cæsalpinia echinata* in powder, are other instances of tonic qualities among these plants; and in the *Dividivi* or *Libidibi* pods, which are produced by *Cæsalpinia coriaria*, we have one of the most astringent of known substances. The native practitioners in India prescribe the dried buds and young flowers of *Bauhinia tomentosa* in certain dysenteric affections. The bark of *Bauhinia variegata*, and also of *Cassia auriculata*, are, according to Roxburgh, used by the natives in tanning and dyeing leather, as well as in medicine. The leaves of *Caulotretus microstachyus* and various *Bauhinias* are used in Brazil under the name of *Unha de Boy*, or *Oxhoof*, as mucilaginous remedies. *Panococco*-bark, obtained from *Swartzia tomentosa*, is a powerful sudorific; its wood is very hard and intensely bitter. The roots of *Cæsalpinia Nuga* and *Moringa* are diuretic. Among dyes are *Logwood*, the wood of *Hæmatoxylon campeachianum*, and the red dye yielded by several *Cæsalpinias*, especially *C. echinata*, which yields the *Brazil-wood*, or *Pernambuco-wood* of commerce. The *Bukkum* or *Sappan-wood* of India belongs to *Cæsalpinia Sappan*. *Camwood* or *Barwood* belongs to *Baphia nitida*; it yields a brilliant red colour, but it is not permanent; the dark-red seen in the English *Bandana* handkerchiefs is produced by it, rendered deeper by sulphate of iron. *Melanoxylon Braüna*, a large Brazilian tree, has a remarkable reddish-brown colouring matter in both its wood and bark. Several afford timber. The *Brazil-wood* of commerce is obtained from *Cæsalpinia Brasiliensis*. The timber of *Hymenæa Courbaril*, the West-Indian Locust-tree, is close-grained and tough; it is in request in England for tree-nails in planking vessels, and for the beams and planks of steam-engines. *Eperua falcata* is the *Wallaba-tree* of Guiana, according to Sir R. Schomburgk, who informs us that its wood is deep red, frequently variegated with whitish streaks, hard, heavy, shining, and impregnated with an oily resin, which makes it very durable. The bark is bitter, and is used by the *Arawaak* Indians as an emetic. The *Purple Heart*, a Guiana timber tree of great toughness, whose timber is found invaluable for resisting the shock of artillery discharges, on which account it is employed for mortar beds, is the *Copaifera pubiflora* and *bracteata*. The balsam is said to gush out of the heart of these trees in large quantities when wounded.

The size of the timber is sometimes prodigious. The Locust-trees of the West have

Fig. CCCLXXIII.—*Cassia acutifolia*. 1. a flower somewhat magnified.



long been celebrated for their gigantic stature, and other species are the Colossi of South American forests. Martius represents a forest in Brazil, where and among this kind occurred of such enormous dimensions, that fifteen Indians, well proportioned arms, could only just embrace one of them. At the bottom they were 84 feet in circumference, and 60 feet where the boles became cylindrical. By counting the concentric



FIG. CCCLXXIV.

rings of such parts as were accessible, he arrived at the conclusion that they were of the age of Homer, and 332 years old in the days of Pythagoras; one estimate, indeed, reduced their antiquity to 2052 years, while another carried it up to 4194 from which he argues that the trees cannot but date far beyond the time of our Saviour. Some Indian species also yield good timber; others, as *Bauhinia purpurea* and *Passiflora*, have bark employed in making rope. An oil is expressed from the seeds of some, as *Cresalpinia oleosperma*; others exude a milky gum like the *Miroulium* and some other plants, which have at the same time an astringent bark. A balsam called *gummi* is said by Roxburgh to be afforded by his *Bauhinia* tree; it is also collected from *B. emarginata*, in the Deyra Doon, and called *Sem lagand*. *Pithecellobium paniculatum* yields a gum resembling Gum Senegal, in the province of Muro in Texas. *Miconia* The resin Anime is procured from *Hymenaea Conchata*; the resin of *Miconia* is supposed to be the produce of some plant allied to this. That of Malabar, and probably of the East Indies generally, is furnished by *Hymenaea verticillata*. Brazilian Copal flows from several species of *Hymenaea*, and from *Fraxinifera Martiana*. *Miconia Aloexylum Agallochum* produces one of the two sorts of gutta serena, *Eschschol*, or



Lign-aloes, a fragrant substance, which Loureiro states consists of a concretion of the oily particles into a resin in the centre of the trunk ; it is brought on by some disease, and the tree in time dies of it. Of all perfumes it is the most grateful to Oriental nations ; "stimulant, corroborant, cephalic, cardiac." Its scent is used against vertigo and paralysis. Balsam of Copaiva, a valuable acrid oil, largely employed in gonorrhoea, flows from various species of *Copaifera*, probably from all ; the different species, however, yield the drug of different qualities.—*Mart. Mad. Med. Bras.* 115. *Myrospermum peruiferum*, the Quinquino or Balsam of Peru plant, furnishes a fragrant resin, not much used in medicine now, but in request among perfumers and in the manufacture of pastiles ; another species, the *M. toluiferum*, or Balsam of Tolu plant, yields a similar product ; both are employed in the preparation of pectoral lozenges. The seeds of *Cassia Absus* are extremely bitter, somewhat aromatic, and mucilaginous ; they are brought to Cairo from the interior of Africa, under the name of Chichm or Cismatan, and are regarded as the best of remedies for Egyptian ophthalmia.

I do not find many distinct traces of poisonous action among this division of Leguminous plants ; but the seeds of *Detarium senegalense* are said to be venomous ; those of the Nicker-tree (*Guilandina Bonduc*) are emetic ; the inner bark of *Hymenæa Courbaril* is anthelmintic, according to Macfadge n ; the seeds of *Swartzia triphylla* are excessively acrid ; and these, taken with the frequency of a cathartic action, seem a sufficient indication of the presence among them of some principle which in a state of concentration would be venomous.

## MIMOSEÆ.

Astringency in the bark, and the production of a sort of gum in the same part, is the great characteristic of this tribe.—Of gums, *Acacia Verek* and *Adansonii* yield gum senegal on the western coast of Africa ; *A. nilotica* and *Seyal*, gum arabic in Nubia ; something similar is produced in New Holland by *A. decurrens*, and the Silver and Black



Fig. CCCLXXV.

Wattles, (*A. mollissima* and *affinis*) ; and in India by *A. arabica* and *speciosa*, and *Vachellia Farnesiana*.—*Royle*. For an account of the gum forests, see *Fl. Seneg.* 1. 246. The gum of a species of *Acacia* is, to the natives of Swan River, an important article of their food.—*Hook. Journ.* 2. 359.—As an instance of pulse, the seeds of *Parkia africana* are roasted as we roast Coffee, then bruised, and allowed to ferment in water. When they begin to become putrid, they are well washed and pounded ; the powder is made into cakes, somewhat in the fashion of our chocolate ; they are an excellent sauce for all kinds of meat. The farinaceous matter surrounding the seeds forms a pleasant drink, and they also make it into a sweetmeat. The natives of Tasmannia roast the ripening pods of *A. Sophora*, pick out the seeds and eat them.—*Backhouse*. The pulp of the pods of *Inga tetraphylla*, and others, is sweet and mucilaginous.—Tonic and astringent qualities are also present here. The bark of *A. arabica* is considered in India a powerful tonic ; it is also extensively used in tanning leather. A decoction of



**Suborder I. PAPILIONACEAE.** Podalyria, *Leach*.  
 1. *Leach*. Neck.  
 § 3. Australia, etc.  
 Brachyotum, *R. Br.*  
 Calliactis, *Forst.*  
 Oxypetalum, *Forst.*  
 Podalyria, *R. Br.*  
 Isotropis, *Forst.*  
 Oxypetalum, *Forst.*  
 Calliactis, *Forst.*  
 Gompholobium, *Smith*.  
 § 1. Cistropal.  
 Analyses, *Leach*.  
 Pappanthus, *Leach*.  
 Thermopsis, *Br.*  
*Thermopsis*, *Nutt.*  
*Thermopsis*, *Raf.*  
 Baptisia, *Forst.*  
 Cristallipes, *Mich.*  
 Pickernium, *Nutt.*  
 § 2. Cape.  
 Cyclops, *Forst.*  
 Thibetensis, *Sims*.



§ 3. *Crotalariae*.  
*Lupinus*, Linn.  
*Crotalaria*, Linn.  
*Chrysocalyx*, Guillem.  
*Clavulinum*, Desv.  
*Priotropis*, Wight et Arn.

§ 4. *Lotononideæ*.  
*Lotononideæ*, DC.  
*Leptorhiza*, Delil.  
*Leptis*, Eck. Zey.  
*Krebsia*, Eck. Zey.  
*Polylobium*, Eck. Zey.  
*Aulacanthus*, E. Mey.  
*Telesia*, E. Mey.  
*Lipozygis*, E. Mey.  
*Capnitis*, E. Mey.  
*Maria-Antonia*, Parlat.

*Listia*, E. Mey.  
*Rothia*, Pers.  
*Xerocarpus*, Guill. Perr.  
*Argyrolobium*, Eck. Zey.  
*Chasmone*, E. Mey.  
*Trichasna*, Walp.  
*Gamochilum*, Walp.  
*Diotolotus*, Tausch?  
*Melolobium*, Eck. Zeyh.  
*Sphingium*, E. Mey.  
*Dichilus*, DC.

*Calycotome*, E. Mey.  
*Melinispermum*, Walp.  
*Hypocalyptus*, Thunb.  
*Loddigesia*, Sims.  
*Lebeckia*, Thunb.  
*Stiza*, E. Mey.  
*Sarcophyllum*, E. Mey.  
*Acanthobotrya*, Eck. Zeyh.  
*Calobota*, Eck. Zeyh.

*Viborgia*, Thunb.  
*Aspalathus*, Linn.  
*Sarcophyllum*, Thunb.  
*Sarcocalyx*, Walp.  
*Buchenwædera*, Eck. Zeyh.  
*Scaligeria*, Adans.

§ 5. *Cytisææ*.  
*Ulex*, Linn.  
*Stauracanthus*, Link.  
*Adenocarpus*, DC.  
*Erinacea*, Boiss.  
*Spartium*, Linn.  
*Spartianthus*, Link.  
*Genista*, Linn.  
*Retama*, Boiss.  
*Syspene*, Griesb.  
*Calycotome*, Link.  
*Sarothamnus*, Wimm.  
*Lembotropis*, Griseb.  
*Cytisus*, Linn.  
*Laburnum*, Griseb.

#### Subtribe 3. *TRIFOLIÆÆ*.

*Doryenium*, Tourn.  
*Doryenopsis*, Boiss.  
*Lotus*, Linn.  
*Kroeria*, Mönch.  
*Tetragonolobus*, Scop.  
*Scandalida*, Neck.  
*Bonjeania*, Reichb.  
*Trifolium*, Linn.  
*Calycomorphum*, Pres.  
*Galearia*, Presl.  
*Mistyllus*, Presl.  
*Lupinaster*, Mönch.  
*Pentaphyllum*, Pers.  
*Dactylophyllum*, Raf.  
*Amoria*, Presl.  
*Micranthemum*, Presl.  
*Amarensis*, Presl.

*Paramesus*, Presl.  
*Melilotus*, Tourn.  
*Pocockia*, Ser.  
*Trigonella*, Linn.  
*Fæmungracum*, Trn.  
*Buccerus*, Mönch.  
*Falcutula*, Forst.  
*Medicago*, Linn.  
*Diploprius*, Vis.  
*Melissittis*, Mönch.  
*Botryolotus*, Jaub. et Sph.  
*Meristotropis*, Fisch. Mey.  
*Hymenocarpus*, Savi.  
*Cornicina*, Boiss.  
*Physanthyllis*, Boiss.  
*Cynthisis*, Linn.  
*Cytisophyllus*, Javb. et Sph.  
*Ononis*, Linn.

*Anonis*, Tourn.  
*Hosackia*, Dougl.  
*Microlotus*, Benth.  
*Anisotolus*, Benth.  
*Drepanolobus*, Nutt.  
*Synmatium*, Vog.  
*Parochetus*, Ham.  
*Podolotus*, Benth.  
*Goodia*, Salisb. ?

#### Subtribe 4. *INDIGOFERÆÆ*.

*Cyamopsis*, DC.  
*Cordaea*, Spreng.  
*Amecarpus*, Benth.  
*Indigofera senegalensis*  
*Indigofera*, Linn.  
*Sphaeridophorum*, Dsv.  
*Oustropis*, Don.  
*Hemispadon*, Endl.  
*Diplomer*, Raf. ?  
*Acanthotus*, Benth.  
*Indigofera onobrychioides*.

*Carmichaelia*, Br. ?

#### Subtribe 5. *PSORALIEÆÆ*.

*Psoralea*, Linn.  
*Rutaria*, Mönch.  
*Poikadenia*, Ell.  
*Polytropia*, Presl. ?  
*Requienia*, DC.  
*Amorpha*, Linn.  
*Bomypedia*, Neck.  
*Eysenhardtia*, H. B. K.  
*Dalea*, Linn.  
*Patrosella*, Cav.  
*Petalostemon*, Reich.  
*Kuhnistera*, Lam.  
*Cytipogon*, Raf.

#### Subtribe 6. *GALEGÆÆ*.

*Glycyrrhiza*, Linn.  
*Liquiritia*, Mönch.  
*Galega*, Tourn.  
*Calotropis*, Don.  
*Accorombona*, Endl.  
*Cyclogyne*, Benth.  
*Ebenidium*, Jaub. et Sph.  
*Pogonostigma*, Boiss.  
*Tephrosia*, Pers.  
*Peinaria*, Mönch.  
*Brissonia*, Neck.  
*Ercibonius*, Mitch.  
*Cracca*, Linn.  
*Apodynomene*, E. Mey.  
*Xiphocarpus*, Presl.  
*Neelhamia*, Scop.  
*Chadsia*, Boj. ?  
*Wistaria*, Nutt.  
*Thyrsanthus*, Ell.

*Kraunkia*, Raf.  
*Robinia*, Linn.  
*Lennea*, L. K. O.  
*Sabinea*, DC.  
*Poitaea*, DC.  
*Coursetia*, DC.

*Tephrosia*, sect. *Crac-*  
*coides*, DC. ?

*Daubentonia*, DC  
*Glottidium*, Desv.  
*Sesbania*, Pers.  
*Herminiera*, Guill. Per.  
*Agati*, Rheed.  
*Diphysa*, Jacq. ?  
*Corynella*, DC.  
*Corynitis*, Spr.  
*Cianthus*, Sol.  
*Streblorhiza*, Endl.  
*Sutherlandia*, Br.  
*Ptychosema*, Benth.  
*Sylitra*, E. Mey.  
*Lessertia*, DC.  
*Swainsonia*, Salisb.  
*Colutea*, Linn.  
*Halimodendron*, Fisch.  
*Halodendron*, DC.  
*Caragana*, Lam.  
*Eremosparton*, Fisch.  
*Phyllobium*, Fisch.  
*Chesneya*, Lindl.

*Crafordia*, Raf. ?  
*Philenoptera*, Fenzl. ?

#### Subtribe 7. *BRONGNIAR-* *TIEÆÆ*.

*Harpalyce*, Moc. Sess.  
*Megastegia*, Don.  
*Brongniartia*, H. B. K.  
*Peraltea*, H. B. K.

#### Subtribe 8. *ASTRAGALEÆÆ*.

*Homolobus*, Nutt.  
*Kentrophyta*, Nutt.  
*Biserrula*, Linn.  
*Pelecinus*, Tournef.  
*Astragalus*, Linn.  
*Oxytropis*, DC.  
*Spiesia*, Neck.  
*Phaca*, Linn.  
*Guldenstaedtia*, Fisch.  
*Sphaerophysa*, DC.

**Tribe 3. *Vicieæ*.—***Filaments all or 9, connate. Legume continuous. Cylindrical fleshy. Leaves generally cirrhose.*

*Cicer*, Linn.  
*Pisum*, Linn.  
*Ervum*, Linn.  
*Vicia*, Linn.  
*Faba*, Tourn.  
*Wiggersia*, Fl. Wett.  
*Oxygogon*, Raf.  
*Lathyrus*, Linn.  
*Aphaca*, Tourn.  
*Ochrus*, Tourn.  
*Clymen*, Tourn.  
*Nissolia*, Tourn.  
*Cicerella*, Mönch.  
*Anurus*, E. Mey.  
*Astrophia*, Nutt. ?  
*Orobis*, Tourn.  
*Platystegia*, Sweet.

**Tribe 4. *Hedysarææ*.—***Filaments generally connate. Legume transversely*

*articulated, with 1-seeded joints, usually separating and indehiscent.*

Subtribe 1. *ARACHIDEÆÆ*.  
*Stylosanthus*, Linn.  
*Arachis*, Linn.  
*Chapmannia*, Torr. et Gr.

Subtribe 2. *CORONILLEÆÆ*.  
*Scorpiurus*, Linn.  
*Coronilla*, Linn.  
*Antopetitia*, Rich.  
*Arthrolobium*, Desv.  
*Hammalobium*, Fenzl.  
*Ornithopus*, Linn.  
*Hippocrepis*, Linn.  
*Bonaveria*, Scop.  
*Securigera*, DC.

Subtribe 3. *HEDYSARÆÆ*.  
*Diphaca*, Lour.  
*Pictetia*, DC.  
*Brya*, Br.  
*Ormocarpus*, Pers.  
*Planaria*, Desv.  
*Amicia*, Kunth.  
*Zygomeris*, Moc. Sess.  
*Poiretia*, Vant.  
*Turpinia*, Pers.  
*Chaetocalyx*, DC.  
*Bomminghausenia*, Spr.  
*Rhadinocarpus*, Vog.  
*Nissolia*, Jacq.

*Myriadenus*, Desv.  
*Geissaspis*, Wight. Arn.  
*Zornia*, Gmel.

*Adesmia*, DC.  
*Patagonium*, Schrank.  
*Loudonia*, Bert.  
*Rathkea*, Schum.  
*Æschynomene*, Linn.  
*Isodesmia*, Gardn.  
*Sommerlingia*, Mart.  
*Smithia*, Ait.  
*Petagnana*, Gmel.  
*Kotschya*, Endl.

*Bremontiera*, DC. ?  
*Lourea*, Neck.  
*Christya*, Mönch.  
*Alysicarpus*, Neck.  
*Fabricia*, Scop.  
*Hagetschucidera*, Heer.  
*Eleiotis*, DC.  
*Oxydium*, Benn.  
*Phylacium*, Benn.  
*Mecopus*, Benn.  
*Uraria*, Desv.  
*Doodia*, Reichb.  
*Nicholsonia*, DC.  
*Perrottetia*, DC.  
*Desmodium*, DC.  
*Dendrolobium*, W. Arn.  
*Heteroloma*, Desv.  
*Ototropis*, Schauer.  
*Dollinera*, Endl.  
*Codoricalyx*, Hassk.  
*Cyclomorium*, Walp. ?  
*Dicerma*, DC.  
*Anarthrosyne*, E. Mey.  
*Lepedeza*, Rich.  
*Campylotropis*, Rudge.  
*Oxyramphus*, Wall.  
*Hallia*, Thunb.  
*Allagi*, Tourn.  
*Taverniera*, DC.  
*Eversmannia*, Bunge.

\* "This § and sub-tribes 3 to 8 of *Lotææ* will probably require considerable modification as to their circumscription when the genera here enumerated under each shall have been more accurately examined."—G. B.







<i>Coquebertia</i> , Brongn.	<i>Tachigalia</i> , Aubl.	<i>Arouna</i> , Aubl.	Tribe 2. <i>Eumimoseæ</i> .
<i>Swartzia</i> , Willd.	<i>Valentynia</i> , Neck.	<i>Cedarium</i> , Soland.	<i>Entada</i> , Linn.
<i>Riveria</i> , Humb. et Kun.	<i>Tachia</i> , Pers.	<i>Cleyria</i> , Neck.	<i>Plathyminia</i> , Benth.
<i>Townatia</i> , Aubl.	<i>Exostyles</i> , Schott.	<i>Apuleia</i> , Mart.	<i>Stryphnodendron</i> , Mart.
<i>Gynanthistrophe</i> , Poit.	<i>Melanoxylon</i> , Schott.	<i>Detarium</i> , Juss.	<i>Adenantha</i> , Linn.
<i>Possira</i> , Aubl.	<i>Perittium</i> , Vog.	<i>Crudya</i> , Willd.	<i>Elephantorhiza</i> , Benth.
<i>Ritiera</i> , Schreb.	<i>Tamarindus</i> , Linn.	<i>Toucharoa</i> , Aubl.	<i>Tetrapleura</i> , Benth.
<i>Hoelzelia</i> , Neck.	<i>Phyllocarpus</i> , Tulasne.	<i>Apalatoa</i> , Aubl.	<i>Gagnebina</i> , Neck.
<i>Aldina</i> , Endl.	<i>Outea</i> , Aubl.	<i>Waldschmidtia</i> , Neck.	<i>Prosopis</i> , Linn.
<i>Allania</i> , Benth.	<i>Anthonota</i> , Beauv.	<i>Pterogyne</i> , Tulasne.	<i>Lagonychium</i> , Stephens.
<i>Trischidium</i> , Tulasne.	<i>Westia</i> , Vahl?	<i>Zenkeria</i> , Arn.	<i>Algarobia</i> , Benth.
<i>Swartzia</i> sect. <i>Dithyria</i> , Benth.	<i>Intsia</i> , Thouars.		<i>Dichrostachys</i> , Benth.
<i>Cordyla</i> , Lour.	<i>Vouapa</i> , Aubl.	Tribe 8. <i>Dimorphandrea</i> .	<i>Callea</i> , Guillem.
<i>Calycandra</i> , A. Rich.	<i>Macrobolium</i> , Vahl.	<i>Mora</i> , Benth.	<i>Neptunia</i> , Lour.
Tribe 5. <i>Amherstieæ</i> .	<i>Kruegeria</i> , Neck.	<i>Dimorphandra</i> , Schott.	<i>Desmanthus</i> , Willd.
<i>Thylacanthus</i> , Tulasne.	<i>Peltogyne</i> , Vog.		<i>Darlingtonia</i> , DC.
<i>Brownea</i> , Jacq.	<i>Trachylobium</i> , Hayne.	<i>Gleditschia</i> , Linn.	<i>Mimosa</i> , Linn.
<i>Hermesia</i> , Loeffl.	<i>Hymenaea</i> , Linn.	<i>Cerantonia</i> , Linn.	<i>Schrankia</i> , Willd.
<i>Elizabetha</i> , Schomb.	<i>Courbaril</i> , Plum.	<i>Acrocarpus</i> , Arn.	<i>Leptoglottis</i> , DC.
<i>Heterostemon</i> , Desf.	Tribe 6. <i>Bauhinieæ</i> .		<i>Leuceana</i> , Benth.
<i>Amherstia</i> , Wall.	<i>Casparea</i> , Kunth.	<i>Anoma</i> , Lour.	<i>Xylin</i> , Benth.
<i>Jonesia</i> , Rozb.	<i>Bauhinia</i> , Linn.	<i>Metrocynia</i> , Thouars.	Tribe 3. <i>Acacieæ</i> .
<i>Saraca</i> , Burm.	<i>Pometia</i> , Cav.	<i>Baphia</i> , Afz.	<i>Acacia</i> , Willd.
<i>Humboldtia</i> , Vahl.	<i>Phanera</i> , Lour.	<i>Palovea</i> , Aubl.	<i>Vachellia</i> , Arn.
<i>Batschia</i> , Vahl.	<i>Schnella</i> , Radlk.	<i>Ginnammia</i> , Scop.	<i>Farnesia</i> , Gasp.
<i>Schottia</i> , Jacq.	<i>Canlotretus</i> , Rich.	<i>Vatairea</i> , Aubl.	<i>Lysiloma</i> , Benth.
<i>Theodorea</i> , Medik.	<i>Perlebia</i> , Mart.?	<i>Alcexylon</i> , Lour.	<i>Albizzia</i> , Purazz.
<i>Azelia</i> , Sm.	<i>Amaria</i> , Mut.?	Suborder III. <i>Mimoseæ</i> .	<i>Zygia</i> , R. Br.
<i>Pancovia</i> , Willd.?	<i>Etaballia</i> , Benth.	—Corolla valvate in æstivation.	<i>Calliandra</i> , Benth.
<i>Eperua</i> , Aubl.	<i>Cercis</i> , Linn.	Tribe 1. <i>Parkieæ</i> .	<i>Pithecolobium</i> , Mart.
<i>Rothmannia</i> , Neck.	Tribe 7. <i>Cynometreæ</i> .		<i>Enterolobium</i> , Mart.
<i>Panzeria</i> , Willd.	<i>Cynometra</i> , Linn.	<i>Erythrophleum</i> , Afz.	<i>Sieranthus</i> , Benth.
<i>Parivoa</i> , Aubl.	<i>Hardwickia</i> , Rozb.	<i>Fillæa</i> , Guillem. Perr.	<i>Inga</i> , Willd.
<i>Adleria</i> , Neck.	<i>Copaifera</i> , Linn.	<i>Parkia</i> Br.	<i>Affonsea</i> , St. Hù.
<i>Dimorpha</i> , Willd.	<i>Dialium</i> , Linn.	<i>Pentaclethra</i> , Benth.	
<i>Campsiandra</i> , Benth.			

NUMBERS estimated by Mr. Benthams, May, 1845.

	GEN.	Sp.
<i>Papilionaceæ</i>		
Podalyrieæ . . . . .	33 .	350
Loteæ . . . . .	133 .	3000
Hedysareæ . . . . .	52 .	500
Phaseoleæ . . . . .	70 .	650
Dalbergieæ . . . . .	41 .	250
Sophoreæ . . . . .	21 .	50
<i>Cæsalpinieæ</i> . . . . .	88 .	700
<i>Mimoseæ</i> . . . . .	29 .	1000
	467	6500

? *Moringaceæ*.

POSITION.—*Rosaceæ*.—*FABACEÆ*.—*Chrysobalanaceæ*.

Dr. Asa Gray is of opinion that the genus *Krameria*, now placed in *Polygalaceæ* (p. 377), should be referred hither. "The only important character," he observes, "to distinguish *Krameria* from *Leguminosæ* *Cæsalpinieæ* (with which it appears exactly to accord in the æstivation of the corolla), except that the stamens and petals are truly hypogynous, lies in the order of the suppression of the stamens. When those of *Leguminosæ* are irregularly reduced, it is the posterior which become sterile or disappear, while in this genus the anterior stamen is suppressed. But even this character is invalidated; in the first place, by the manifest tendency of the posterior stamens next to suffer reduction, as is shown by their usually smaller size, and by the disappearance of one of them (as I suppose) in *K. triandra*; and secondly, by the rare occurrence of the same order of suppression in the *Leguminosæ*, as in *Dialium* (so admirably illustrated by M. Bennett) and *Casparea*. The trifoliate leaves of *K. cytisoides*, noticed by Dr. Lindley as indicating an affinity with *Sapindaceæ*, may with at least equal propriety be adduced in favour of the relationship with *Leguminosæ*. Whether *Krameria* is actually to be incorporated into the latter family or not, is still an open question; but it is certain that it does not belong to *Polygalaceæ*. From that family it is plainly excluded by the monocarpellary pistil, the relation of the







there called Choho. The pounded fruits of *Berebera ferruginea* is a fish poison in the same country. The *Acacia varians* is so dangerous as to have gained the name of the Poison tree from Sir Thomas Mitchell's party on his journey to the Victoria River. Dr. Royle has shown that Malabar Kino is produced by *Pterocarpus Marsupium*. The Kino of the Dhak or Pulas (*Butea frondosa*) is a similar but distinct substance; appearing in the form of a ruby-coloured, brittle, very astringent Gum.

## ADDITIONAL GENERA.

(Communicated by Mr. Benthams, April, 1853, with the exception of such as are included in brackets.)

*Jansonia*, Kippist, } after *Brachysema*.

*Cryptosema*, Meisner, after *Burtonia*.

*Leptocytisus*, Meisner, after *Phyllota*.

? *Urodon*, Turcz. after *Phyllota*.

*Latrobea*, Meisner, after *Pultenea*.

*Mariantonina*, Parlat. = *Crotalaria*.

*Pentadynamis*, R. Br. } after *Priotropis*.

? *Phyllocalyx*, A. Rich.

*Pachygraphia*, Presl.

*Plagiostigma*, Id.

*Streptosema*, Id.

*Psilolepus*, Id.

*Paraspalathus*, Id.

*Trineuria*, Id.

*Heterolathus*, Id.

*Dendrospartum*, Spach.

? *Gonocytisus*, Id.

*Corothamnus*, Presl.

*Corniola*, Presl.

*Laburnum*, Griseb.

*Petteria*, Presl.

*Podocytisus*, Boiss. after *Cytisus*.

*Loxospermum*, Hochst. after *Trigonella*.

*Eilemanthus*, Hochst. after *Indigofera*.

*Meladenia*, Turcz.

*Clidanthra*, R. Br.

*Trichopodium*, Presl. = *Dalea*.

*Meristotropis*, Fisch. after *Glycyrrhiza*.

*Catalpa*, Edgw. = *Pogonostigma*.

*Kiesera*, Reinw.

*Macronyx*, Dalz.

*Cracca*, Benth.

*Typhr. Craccaoides*, DC.

[*Berebera*, Hochst. near *Sesbania*.]

*Hermimiera* must be removed to *Hedysaree*.

*Eriophaca*, Boiss.

*Ammothamnus*, Bunge,

*Petteria*, A. Gray,

*Eversmaunia*, Bunge,

*Stracheya*, Benth.

? *Pentadynamis*, R. Br.

*Phava*,

*Diplothea*, Hochst.

*Coppalera*, Todar. = *Ervum*.

*Helminthocarpus*, A. Rich. after *Antopetitia*.

*Hermimiera*, Guillem.

*Acrotaphros*, A. Rich.

*Macromiscus*, Turcz.

*Ruppelia*, A. Rich.

*Hegtschweilera*, Regel, = *Alysicarpus*.

*Nicolsonia*,

*Cyclomorium*,

*Sagatia*, Walpers,

*Ougeimia*, Benth.

*Dendrolobium*, W. & A.

*Phyllodium*, Desv.

*Pteroloma*, Desv.

*Catenaria*, Benth.

*Campylotropis*,

*Oxyrhaphis*,

*Phlebosporium*, Jungh. } = *Lespedeza*.

*Ebenus*, L. after *Taverniera*.

*Eriocarpus*, Bertol. = *Onobrychis*.

*Heterocarpaea*, Scheeb. = *Galactia*.

*Kiesera*, = *Tephrosia*.

*Leucodictyon*, Dalz. after *Galactia*.

*Neustanthus*, Benth. before *Collaea*.

*Chirocalyx*, Meisner.

*Micropteryx*, Walp.

*Duchassainya*, Walp.

*Robynsia*, Martens,

*Mintelersia*, Martens,

*Spatholobus*, Hassk.

*Drebbelia*, Zoll.

*Dissingia* = *Psophocarpus*.

*Cantharospermum* = *Atylosia*.

*Lepidocoma*, Jungh. = *Flemingia*.

*Phyllocarpus*, Benth. = *Amphymenium*.

*Toxotropis*, Turcz. after *Lonchocarpus*.

*Mundulea*, Benth.

*Otosema*, Benth.

*Fornarinia*, Bertol.

*Ostryocarpus*, Hook. fil.

*Endospermum*,

*Triptolomea*,

*Podiopedalum*, Hassk.

*Spatholobus*, to *Erythrinae*.

? *Potholobium*, Presl. to *Phaseoleae*.

[*Cyanobotrys*, Zucc. near *Andira*.]

*Dermatophyllum*, Scheele, after *Sophora*.

*Lagria*,

*Callerya*,

*Baphia*, Afz.

*Bracteolaria*, Hochst.

*Leucomphalus*, Benth.

*Bowringia*, Champ.

*Cinclidocarpus*, Zoll.

*Wagatea*, Dalz.

*Balsamocarpus*, Clos. end of *Cesalpinieae*.

*Petalostylis*, R. Br. after *Labichea*.

[*Berlinia*, Soland. near *Azelia*.]

*Rodschiedia*, Miq. after *Vouapa*.

*Piliostigma*, Hochst. after *Phanera*.

*Baphia* belongs to *Sophoreae*.

*Belaria*, A. Rich.

*Besenna*, A. Rich.

*Chelonanthus*, Lehm.

*Tetrachilos*, Lehm.

*Microlobus*, Presl. to *Mimoseae*?

[*Alexandra*, Schomb.]

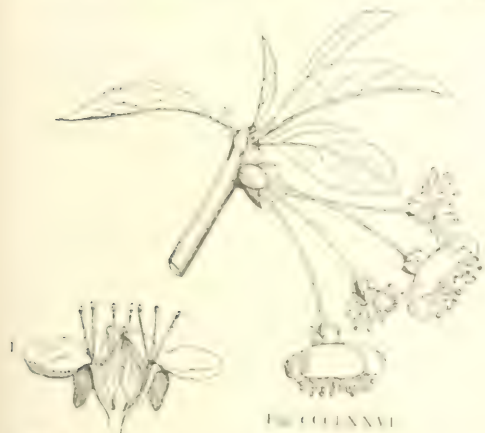


## O... CN DRIFT ACT E... M...

[illegible]

**DIAGNOSIS**—*Heart Failure*, and *polypharmacy* require *pharmacokinetic* and *pharmacodynamic* interactions with the *pharmacokinetic* and *pharmacodynamic* interactions.

Trees or shrubs. Leaves simple, alternate, usually glabrous beneath the base; stipules simple, mostly glandular. Flowers white or pink, or reddish or purple. Ovary



1001111



**INDEX**

5-toothed, deciduous, lined with a disk; the fifth lobe next the axis. Yawls 2, perian-  
thous. Stamens 20, or thereabouts, arising from the throat of the calyx, anthers  
curved inwards; anthers imbricate, 2-celled, bursting longitudinally. Ovary super-  
schary, simple, 1-celled; ovules 2, suspended; styles terminal, with a faintly 2-lobed  
side, terminating in a reniform stigma; ovules anatropal. Fruit a drupe, with  
putamen sometimes separating spontaneously from the sarcocarp. Seed oblong, ter-  
minal, suspended. Embryo straight, with the radicle pointing to the hilum; perisperm  
thick, plano-convex; albumen none.

This Order is distinguished from Rosaceae and Apocynaceae on the fruit being a solitary, simple carpel, changing when ripe into a drupe, the latter requiring generally by the more general presence of hydrocyanic acid; from Leguminosae by the fruit being a legume, and also by their regular petals and stamens, and responding by the segment of the 5-lobed calyx of that Order being inferior, not superior; from Rubiaceae by the terminal styles and regular petals and stamens. There may be a few other Plums with an indefinite number of ovaries arising irregularly from the sides of the calyx, and therefore exhibiting a tendency, on the part of this Order, to approach one of the distinguishing characters of Rosaceae. It is not a little remarkable that here, where we have an approach to the structure of Mimosaceae by the compound fruit, we have a resemblance to the property possessed by that subfamily, of yielding gum in the bark; the peculiar astringency of some species is also answered by that of *Rubus*, *Catechu* and the like.

Natives exclusively of the northern hemisphere, where they are found in cold or temperate climates. One species, *Cervus mandchuricus*, has been introduced into some Prisms in the woods of Brazil; a kind of Alamo. *Young's Cervus mandchuricus*.

FIG. CCCLXVI. Censuſ conuocatus. 1. a. ſcena ad hunc diem.

The CCCLXXVI. Cereus communis. 1. a section of its flower. 2. a section of its stem. 3. a section of its fruit, showing the position of the seed.



inhabits hot arid plains in Mexico ; and another, *A. cochinchinensis*, is reputed to grow in the woods of Cochín-China.

The astringent febrifugal properties of Roseworts, with which Order this is usually combined, are also found here ; as in the bark of *Cerasus virginiana*, which is prescribed in the United States, of the *C. Capollim* of Mexico, and of others to be mentioned presently. They are, however, better known for yielding an abundance of prussic, or hydrocyanic acid, a deadly principle residing in the leaves and kernel ; in consequence of which some of the species are poisonous to cattle which feed upon them : as, for example, the *C. capricida*, which kills the goats of Nipal ; and the *C. virginiana*, which is known in North America to be dangerous. The oil of Bitter Almonds is extremely poisonous, and many fatal cases of death arising from taking them into the stomach are on record. They have, nevertheless, been recommended as a cure for intermittent fever. They produce urticaria, and are said to be an antidote to intoxication. The flowers and kernels of the Peach have similar qualities. Dr. Christison mentions a case of a gentleman who died in consequence of having swallowed a salad of the flower ; and another of a child which perished after taking a decoction of the flowers to destroy worms. The leaves, bark, and fruit of *C. Laurocerasus*, the common Laurel, and the oil obtained from them are virulent poisons ; even the vapour of the former will destroy insect life. Martius says that this secretion is greatly increased in Brazil. *C. Padus*, the Bird Cherry, has similar properties, but in a less degree. They all of them, also, yield a gum analogous to gum tragacanth. Notwithstanding, however, the poisonous principle that is present in them, their fruit is, in many cases, a favourite food ; that of the *Amygdalus* (Peach and Nectarine), *Prunus* (Plum), and *Cerasus* (Cherry), are among the most delicious with which we are acquainted ; the seed of *Amygdalus* is familiar to us under the name of Almonds, and its oil under the name of Oil of Almonds. The bark of the root of *C. Capollim* is used in Mexico against dysentery. The leaves of *Prunus spinosa* (Sloe), and *C. avium* (Wild Cherry), have been employed as a substitute for Tea. The former are well known to afford one of the means used in Europe for adulterating the black tea of China. *Prunus domestica*, or the common Plum, yields those fruits sold in the shops under the name of Prunes, which are chiefly prepared in France, from the varieties called the St. Catherine and the Green-gage ; and in Portugal from a sort which derives its name from the village of Guimaraens, where they are principally dried. They contain so large a quantity of sugar, that brandy is distilled from them when fermented ; and it has even been proposed to manufacture sugar from them. The kernel of *Prunus brigantia* yields a fixed oil, called Huile des Marmottes, which is used instead of olive or almond oil. The bark of *Prunus spinosa* is one of the substances that has been reported to resemble Jesuits' bark in its effects. *Prunus Coccornilia* yields a bark, the febrifugal properties of which are spoken of very highly. According to Tenore, it is a specific for the cure of the dangerous intermittent fevers of Calabria, where it grows. A variety of *Cerasus avium* is used, in the Vosges and Black Forest, for the preparation of the liqueur known under the name of Kirschenwasser. The flowers of *Amygdalus persica* (Peach), are gently laxative, and are used advantageously for children. The kernel of *Cerasus occidentalis* is used for flavouring the liqueur Noyau.

#### GENERA.

*Pygeum*, Gärtn.  
*Polydonta*, Blum.  
*Polystorthis*, Blum.  
*Amygdalus*, Linn.

*Amygdalophora*, Neck. *Prunus*, Linn.  
*Persica*, Tournef. *Armeniaca*, Tournef.  
*Trichocarpus*, Neck. *Prunophora*, Neck.  
*Cerasideos*, Zucc. *Cerasus*, Juss.

*Cerasophora*, Neck.  
*Padus*, Endl.  
*Laurocerasus*, Tournef.

#### NUMBERS. GEN. 5. Sp. 110.

POSITION.—Rosaceæ.—DRUPACEÆ.—Fabaceæ ?  
*Thymelaceæ*.







plants of this Sub-order are very apt to produce monstrous flowers, which depart sometimes in a most remarkable degree from their normal state. No Order can be more instructively studied with a view to morphological inquiries; particularly the common Pear when in blossom. A remarkable permanent monster of this kind, with 14 styles, 14 ovaries, and a calyx with 10 divisions in two rows, is described in the *Revue Encyclopédique*, 43. 762.; it exhibits a tendency, on the part of Appleworts, to assume the indefinite ovaries and double calyx of Roseworts. I have seen a *Prunus* in a similar state. Almondworts are known by their superior solitary ovary and drupaceous fruit.

Found plentifully in Europe, Northern Asia, the mountains of India, and North America; rare in Mexico, unknown in Africa, except on its northern shore, and in Madeira, and entirely absent from the southern hemisphere; a solitary species is found in the Sandwich Islands.

The fruit as an article of the dessert, and the flowers for their beauty, are the chief peculiarities of this Order, which consists exclusively of trees and bushes, without any herbaceous plant. The Apple, the Pear, the Sorb, the Medlar, the Quince, the Service, the Rowan-tree or Mountain Ash, are all well known, either for their beauty or their use. The wood of the Pear is almost as hard as Box, for which it is even substituted by wood engravers; the timber of the Beam-tree (*Pyrus Aria*) is invaluable for axletrees. The bark of *Photinia dubia* is used in Nipal for dyeing scarlet. Malic acid is contained, in considerable quantity, in Apples; it is also almost the sole acidifying principle of the berries of the Mountain Ash (*Pyrus Aucuparia*). The mucilaginous seeds of the Quince are employed in medicine; its fragrant fruits are used in the preparation of a kind of wine analogous to Cider and Perry, obtained from Apples and Pears. Wohler has found cenanthic ether in the rind of the Quince. Prussic acid occurs in their seeds, and is even abundant in *Cotoneaster Uva Ursi*, and *microphylla*. The flowers, bark, and root of *Pyrus Aucuparia* contain so much of the peculiar essential Oil of Almonds as to yield fully as much hydrocyanic acid as that procurable from an equal weight of Cherry-laurel leaves.—*Buchn. Rep.* 27. 238.

#### GENERA.

*Cydonia*, Tournef.  
*Chaenomeles*, Lindl.  
*Pyrus*, Lindl.  
*Pyrophorum*, Neck.  
*Apyrophorum*, Neck.  
*Lazarotus*, Medik.  
*Halmia*, Medik.  
*Malus*, Tournef.

*Aria*, DC.  
*Torminaria*, DC.  
*Eriolobus*, DC.  
*Sorbus*, Linn.  
*Aucuparia*, Medik.  
*Adenorhachis*, DC.  
*Aronia*, Pers.  
*Chamæmespilus*, DC.

*Osteomeles*, Lindl.  
*Mespilus*, Lindl.  
*Mespilophora*, Neck.  
*Amelanchier*, Medik.  
*Petromeles*, Jacq. f.  
*Peraphyllum*, Nutt.  
*Cotoneaster*, Medik.  
*Nägelia*, Lindl.

*Hesperomeles*, Lindl.  
*Eriobotrya*, Lindl.  
*Photinia*, Lindl.  
*Myriomeles*, Lindl.  
*Chamæmeles*, Lindl.  
*Rhaphiolepis*, Lindl.  
*Cratægus*, Linn.  
*Stranvæsia*, Lindl.

NUMBERS. GEN. 16. Sp. 200.

*Onagraceæ.*

POSITION.—*Rosaceæ.*—*POMACEÆ.*—*Drupaceæ.*

*Myrtaceæ.*



ORDER CCXII. SANGUISORBACEÆ. *Sanguisorba*.

Rosaceæ, § Sanguisorbaceæ, *Juss. Gen. Syst. (Paris) 116. (P. 441), 2. 1805. (Hoffmann, *Abhandl. Comp. Bot. Medicin.* 2. 46).*

DIAGNOSIS.—*Rosæd. Erogenæ, with apetalous flowers, a solitary ovary, included in a hard and calyculate fruiting a false pericarp.*

Herbaceous plants or under shrubs, occasionally spiny. Leaves simple and lined, or compound, alternate, with stipules. Flowers small, often capitate. Ovary 1-5.



FIG. CCCLXXIX.

abortion. Calyx with a thickened tube and a 3-4- or 5-lobed limb, its tube lined with a disk. Petals none. Stamens definite, sometimes fewer than the segments of the calyx, with which they are then alternate, arising from the within of the calyx. Anther 2-celled, imbricate, bursting longitudinally, occasionally beaked, beakless. Ovary solitary, simple, with a style proceeding from the apex of the ovary; sometimes solitary, always attached to that part of the ovary which is near the base of the ovary; stigma compound or simple. Nut solitary, included in the often thickened base of the calyx. Seed solitary, suspended or ascending; embryo without albumen; ovule superior or inferior; cotyledons large, plano-convex.

This Order, usually combined with Roseæ, appears to demand a distinct section on account of its constantly apetalous flowers, its hardened calyx, and the reduction of carpels to one only; it is not, however, distinguishable by any other character, and therefore *Agrimonia*, sometimes stationed here, must be placed with *Thalictrum*, because of its petals. Its habit, indeed, is by no means that of *Sanguisorba*. When the ovule is suspended, the style arising from below the apex of the ovary, but when the style proceeds from the base of the ovary, the ovule is sometimes so adherent to the ovary immediately over against the apex of the style. Various kinds of adhesion between the leaves and the stipules also place in the genus *Thalictrum*, and have given rise to a number of errors; for an explanation of such, see Dr. Charles's remarks in the *Annales des Sciences Naturelles*, i. 347.

Natives of heaths, hedges, and exposed places in Europe, North and South America, beyond the tropics, and the Cape of Good Hope, in which latter country they represent the Roseworts of Europe.

Their general character is astringency. A decoction of *Agrimonia* is astringent, tonic; and is asserted, by *Fredericus Hoffmann* and others, to have the effect of per-

FIG. CCCLXXIX. *Sanguisorba officinalis*. 3. a flower with a single ovary in the center, and the calyx cut away. 4. a ripe fruit, from which the calyx has been removed. 5. a transverse section of fruit and calyx. 6. transverse section of a fruit.



ing the faded beauty of ladies to its earliest freshness. *Sanguisorba officinalis*, or common Burnet, is a useful fodder. The root of *Sanguisorba canadensis* is said to be bitter, astringent, nauseous, and emetic, and its fruit stupefying.—*Endl.* The leaves of *Acæna Sanguisorba* are said to be an excellent substitute for Tea. The plant is common everywhere in Tasmannia, and is well known from the annoyance caused by its fruit hooking to the stockings and other parts of the dress of pedestrians.—*Backhouse.* The Peruvians employ a decoction of *Margaricarpus setosus*, a little needle-leaved bush with pearly succulent fruit, against hæmorrhoids.

#### GENERA.

<i>Alchemilla</i> , <i>Tournef.</i>	<i>Ptilochæta</i> , <i>Turcz.</i>	<i>Tetraglochin</i> , <i>Püpp.</i>
<i>Aphanes</i> , <i>Linn.</i>	<i>Sanguisorba</i> , <i>Linn.</i>	<i>Polylepis</i> , <i>Ruiz et Pav.</i>
<i>Adenostoma</i> , <i>Hook. et Arn.</i>	<i>Poterium</i> , <i>Linn.</i>	<i>Margaricarpus</i> , <i>Ruiz et P.</i>
<i>Acæna</i> , <i>Vahl.</i>	<i>Bencomia</i> , <i>Webb.</i>	<i>Cliffortia</i> , <i>Linn.</i>
<i>Ancistrum</i> , <i>Forst.</i>	<i>Leucosidea</i> , <i>Eckl. et Zeyh.</i>	<i>Morilandia</i> , <i>Neck.</i>

NUMBERS. GEN. 12. Sp. 125.

*Scleranthaceæ.*

POSITION.—*Drupaceæ.*—SANGUISORBACEÆ.—*Rosaceæ.*

*Nyctaginaceæ.*

#### ADDITIONAL GENERA.

*Poteridium*, *Spach.*

*Sarcopoterium*, *Id.*

*Monographidium*, *Presl.* near *Cliffortia*.



GROSS, CYNTHIA ROSALEE — *Continued*

*Protonotaria*, *Lept. long.* (44, in part) (1789), *Tab. Syst. Nat.* 2, 326. *Protonotaria* (1789),  
*Supplementum, Tab. Syst. Nat.* (1790), 16, 494 (p. 2, 326). *Protonotaria* (1790),  
*Compendium, Nov.* 216. *Protonotaria*, *Ill. Faun.* 2, 348. 1800. *Method. Conchyliol.* 36, 108.  
*Trifolium*, *Nat.*

DIAGNOSIS.—*Rural* *Empusa*, with palpebral foveae, and strongly bent palpi, and quite as many as five male striae.

Herbaceous plants or shrubs. Leaves simple or compound, alternate, often with 2 stipules at their base, occasionally dotted. Flowers loosely arranged, usually



1. 0 0 0 1 \ \ \



occasionally 4 by abortion. Calyx 4- or 5-foliate, with a long tube, being the base or surrounding the orifice; the fifth lobe next the axis. Petals 5, perianth-like, equal or 0. Stamens definite in number or oo, arising from the calyx-tube within the point of invagination curved inwards; anthers linear, 2-lobed, sometimes faintly bilobed, papery, superior, either solitary or several, 1-lobed, sometimes extending into a phallician pistil; ovules 2 or more, anatropal, suspended, very rarely bent, often latero-stigmas usually simple, and emarginate on one side. The orifice located near the apex, or foliicles containing several seeds. Seeds small, rarely large, papery, pointed. Embryo straight, with a taper short radicle pointing to the hilum and the cotyledons Albumen 0.

This Order furnishes the best of all analogies with the representation of the universe.

Fig. CCLXXX. 1. *Spiraea ulmaria*; 2. flower of *Pyrausta nivalis*; 3. flower of *A. a. a.*; 4. mouth of the flower of a *Spiraea*.



ing many of the more important characters of Crowfoots, and in some measure their habits. It is, however, known by its perigynous stamens and exalbuminous seeds, whose embryo, though small, is amygdaloid. It differs from Appleworts in its ovary being superior, and from Almondworts in that organ being single and changing into a drupe. Saxifrages, which stand very near Roseworts, are readily known by their albuminous seeds, definite stamens, and partially combined, somewhat valvate carpelary leaves. Chrysobalans have a single carpel, but their style originates from the base, not the apex of the ovary. Sanguisorbs are apetalous, with the tube of the calyx hardened and changed into a false pericarp. That Roseworts have some intimate relationship with Myrtleblooms is proved by Appleworts; but a new evidence of this fact has lately been obtained in the form of Roses discovered in China by Mr. Fortune, which have faintly but distinctly transparent dots in the leaves.

Natives chiefly of the temperate or cold climates of the northern hemisphere; a very few are found on high land within the tropics, and an inconsiderable number in the southern hemisphere. Only one species occurs in the West Indies, viz. *Rubus jamaicensis*; several are natives of high land in the East Indies, within the tropics, especially *Potentillas* and *Rubi*; the South American species chiefly consist of a few kinds of *Rubus*, and plants belonging to the section *Quillaia* which are all South American. *Neuradeæ* are found in the north of Africa and at the Cape of Good Hope, perhaps also in Mexico. An elaborate account of the geographical distribution of these plants has been given in the *Linnaea*, vol. xvii. p. 549, by Mr. Frankenheim.

The fruits of many species of *Fragaria* (Strawberry) and *Rubus* (Raspberry and Blackberry) are valuable articles of the dessert. No Roseworts are unwholesome; they are chiefly remarkable for the presence of an astringent principle, which has caused some of them to be reckoned febrifuges. The root of *Tormentilla* is used for tanning in the Feroe Isles. *Potentilla anserina* has been employed in the same manner, and *P. reptans* as a febrifuge. *Geum urbanum* and *rivale*, *Comarum palustre* and *Sieversia montana* have been compared, for efficacy, to *Cinchona*. The leaves of *Rubus arcticus* and *Rosa rubiginosa* have been employed as substitutes for Tea. The root of *Spiræa filipendula* and *Ulmaria* has been used as a tonic. *Agrimonia Eupatoria* yields a decoction useful as a gargle, and has some celebrity as a vermifuge. Indian Chocolate-root, which is probably *Geum rivale*, is much employed in the United States in diseases of the bladder. The root of *Rubus villosus* is a popular astringent medicine in North America. Two or three tea-spoonfuls of the decoction, administered three or four times a day, has been found useful in cholera infantum. Mixed, however, with this astringency, is the presence of an emetic quality. The roots of *Gillenia trifoliata* and *stipulacea* are emetic, and perhaps tonic. They are used in the United States as *Ipecacuanha*. One of the most powerful anthelmintics in the world belongs to this family. It is an Abyssinian plant, called *Cusso*, or *Cabotz*, and known to Botanists by the name of *Brayera anthelmintica*. Upon the authority of Brayer, after whom it is named, two or three doses of the infusion are sufficient to cure the most obstinate case of tænia. The various species of *Rosa* form some of the greatest beauties of the garden. The fruit of *R. canina* and other allied species is astringent, and employed in medicine against chronic diarrhœa and other maladies. The petals of *R. moschata* and *damascena* yield a highly fragrant essential oil, called *Attar of Roses*; those of *R. gallica* are astringent when dried with rapidity, and are sometimes found useful in cases of debility, such as leucorrhœa, diarrhœa, &c. The *Quillaia* are remarkable for their saponaceous secretions. *Quillaia saponaria* yields one of the barks called *Quillai*, used as a substitute for soap. "Two ounces of the bark are sufficient to wash a dress; it is also said to remove all kinds of spots and stains, and to impart a remarkable lustre to wool." It contains a substance which excites violent sneezing, and is closely allied to saponine.—*Chem. Gaz.* 1844. 216. According to Martius the *Quillaia brasiliensis* has the same property.

#### GENERA.

I. ROSIDÆ. — Calyx tube fleshy, covering over the achænia.  
*Rosa*, Tournef.  
Lowea, Lindl.  
*Hulthemia*, Dumort.  
*Rhodopsis*, Ledeb.

II. POTENTILLIDÆ. — Calyx tube herbaceous. Fruit a heap of achænia.  
*Dalibarda*, Linn.  
*Rubus*, Linn.  
? *Cylactis*, Raf.

*Fragaria*, Linn.  
*Duchesnea*, Smith.  
*Comarum*, Linn.  
*Potentilla*, Linn.  
*Quinquefolium*, Tourn.  
*Pentaphylloides*, Tour.  
*Tormentilla*, Tourn.

*Argentina*, Blackw.  
*Boottia*, Bigel.  
*Trichothalamus*, Lehm.  
*Horkelia*, Cham. et Schl.  
*Chamærhodos*, Bung.  
*Dryadanthæ*, Endl.  
*Sibbaldia*, Linn.



Fig. CCCLXXXI.

Fig. CCCLXXXI.—Perpendicular section of a Rose-flower.







# ALLIANCE XLIII. SAXIFRAGALES.—THE SAXIFRAGAL ALLIANCE.

DIAGNOSIS. — *Perigynous Exogens, with monodichlamydeous flowers, consolidated carpels, sutural or axile placenta, 00 seeds, a polypetalous corolla, if any is present, and a small taper embryo with a long radicle and little or no albumen.*

The transition from the Rosal to the Saxifragal Alliance has already (p. 539) been shown to take place by way of Roseworts and Saxifrages. To the Rhamnal Alliance Saxifragals pass by way of Brexiads, which are singularly like the genus *Elæodendron* among Spindle-trees. The resemblance of the Orders included in this Alliance is so great, that the first three are often regarded as mere forms of the Order of Saxifrages; Loosestrifes are less obviously similar, but if their herbaceous genera are compared with Saxifrages, or their shrubs with Brexiads, the affinity becomes sufficiently striking. Loosestrifes appear to furnish a lateral connection with Melastomads or Syringas.

## NATURAL ORDERS OF SAXIFRAGALS.

<i>Styles distinct. Leaves alternate</i> . . . . .	214. SAXIFRAGACEÆ.
<i>Styles distinct. Leaves opposite, without stipules</i> . . . . .	215. HYDRANGEACEÆ.
<i>Styles distinct. Leaves opposite, with large interpetiolar stipules.</i>	216. CUNONIACEÆ.
<i>Styles consolidated. Calyx many-leaved. Albumen 0. Leaves alternate</i> . . . . .	} 217. BREXIACEÆ.
<i>Styles consolidated. Calyx tubular, permanent, with the petals in the margin. Albumen 0. Leaves opposite</i> . . . . .	
	218. LYTHRACEÆ.



ORDER CUNIV. SAXIFRAGACEÆ.—*Saxifragales*.

*Saxifragaceæ*, *Juss.* *Gen. Pl.* 1178. *Fl. Ind.* 2, 377. *Saxifragales*, *DC.* and *Walt.* 407. *Cult. Saxifragaceæ*, *Dr. Planch.* 4, 9. *Fl. Ind.* 2, 377. *Monocot.* 1178.

DIAGNOSIS.—*Saxifragales*, *Engelm.*, with *Monocot.* 1178. *Fl. Ind.* 2, 377.

Herbaceous plants, often growing in patches. Leaves often alternate or opposite, alternate, with or without stipules. Flowers sessile, often calyx 5-lobed, often with superior or inferior, of 4 or 5 sepals, which entire, rarely or less at their base. Petals

5 or 9, inserted between the lobes of the calyx. Stamens 5-10, inserted within the calyx, or between the ovary; anthers linear, bursting longitudinally. Disk either hypogynous or perigynous, sometimes nearly obsolete, sometimes annular and sometimes rarely consisting of 3 scales. Ovary inferior, or nearly superior, usually consisting of 2 carpels, adhering more or less by their base, but distinct and diverging at the apex; sometimes 2-lobed with a central placenta; sometimes 1-lobed with a dorsal placenta, adhering to the suture. Style simple. Stigma sessile on the tip of the lobes of the ovary. Fruit generally a moniliform 1- or 2-celled capsule with the cells distending when ripe. Seedlings rare, very minute; usually with long triangular reticulations on the surface of a transverse root. The embryo, in the axis of fleshy albumen, with no cotyledons next the filling.

So true is the affinity of *Saxifragales* and *Ranunculales*

that in some cases it is difficult to distinguish the genera. Systematists have appeared to recognize two distinct tribes, namely, that of *Saxifragales* being retained the consolidation of the fruit and the formation of albumen, and that of *Ranunculales* in which towards a division of the ovary and the albumen of albumen. It compared with other tribes in their own albumen, but will be found to differ from *Ranunculales* and *Primulales* in their



FIG. CCLXXXIII

united styles, from *Cunoniaceæ* and *Hydrangeaceæ* in their opposite leaves.

More remote affinities have been indicated by authors. That they bear the comparison in some respects to *Cloves*, especially to the *Myrtaceæ* (family of *Myrtaceæ*) they differ in the insertion of the stamens, placentation, situation of the ovary, and otherwise. Purslanes, which may be compared with *Hydrangeæ*, are however, in the situation of the stamens, want of stipules, and albumen, and, in the structure of the embryo, in the want of symmetry in the parts of the flower, and in placentation. *Currentworts* correspond in the general structure of the flower, but differ widely in the ovary being completely sessile and inferior, with two parietal placentae, in the seeds being attached to long undivided seeds, in the albumen being corneous, and the embryo extremely minute. The *Currentworts* resemble more *Saxifragales* approach *Houseleeks*, differing in having a smaller number of stamens, which are partially united both with each other and the calyx, and in being sessile, or sessile at the base of the carpels.

*Chrysosplenium* is remarkable for the want of petals. *Dracopis* has the stamens

FIG. CCLXXXIII.—*Saxifraga* *repens*. 1. the flower; 2. a longitudinal section of the ovary; 3. a longitudinal section of the ovary; 4. a longitudinal section of the ovary; 5. a longitudinal section of the ovary; 6. a longitudinal section of the ovary.



equal in number to the petals and opposite them, thus indicating some analogy with the monopetalous Primworts.

Little herbaceous plants, usually with white flowers, cæspitose leaves and glandular stems : some of the species have yellow flowers, others have red, but none blue. They are natives of mountainous tracts in Europe and the northern parts of the world, frequently forming the chief beauty of that rich turf which is found near the snow in high Alpine stations. Some grow on rocks and old walls, and in hedgerows, or near rivulets, or in groves. None are produced in tropical countries.

The whole Order is more or less astringent. The root of *Heuchera americana* is powerfully so, whence it is called in North America Alum-root. Otherwise the species possess no known properties ; for the old idea of their being lithontriptic appears to have been derived from their name rather than their virtues. Some pretend that *Saxifraga crassifolia* may be used as a substitute for Tea ; and *Chrysosplenium alternifolium* has had some small reputation, in former days, as a slight tonic. The glutinous exudation of a few of them is acrid.

#### GENERA.

<i>Eremosyne</i> , Endl.	<i>Porophyllum</i> , Gaud.	<i>Ligularia</i> , Duval.	<i>Heucherella</i> , Torr. et A. Gr.
<i>Donatia</i> , Forst.	<i>Dactyloides</i> , Tausch.	<i>Micropetalum</i> , Tausch.	<i>Tolmiea</i> , Torr. et A. Gr.
<i>Vahlia</i> , Thunb.	<i>Saxifraga</i> , Haw.	<i>Cotylea</i> , Haw.	<i>Mitellopsis</i> , Meisn.
<i>Russelia</i> , Linn. f.	<i>Muscaria</i> , Haw.	<i>Lobaria</i> , Haw.	<i>Drummondia</i> , DC.
<i>Bistella</i> , Del.	<i>Triplinervium</i> , Gaud.	<i>Hirculus</i> , Tausch.	<i>Mitella</i> , Tournef.
<i>Nimmoia</i> , Wight.	<i>Bergeria</i> , Mönch.	<i>Kingstonia</i> , Gray.	<i>Tellima</i> , R. Br.
<i>Boykinia</i> , Nutt.	<i>Megasea</i> , Haw.	<i>Ciliaria</i> , Haw.	<i>Lithophragma</i> , Nutt.
<i>Zahlbrucknera</i> , Reichenb.	<i>Geryonia</i> , Schrank.	<i>Leptasea</i> , Haw.	<i>Lithophragma</i> , Torr.
<i>Oreosplenium</i> , Zehlb.	<i>Eropheron</i> , Tausch.	<i>Leptarrhena</i> , R. Br.	<i>Sullivantia</i> , Torr.
<i>Saxifraga</i> , Linn.	<i>Micranthes</i> , Tausch.	<i>Lütkea</i> , Bong.	<i>Tiarella</i> , Linn.
<i>Porphyron</i> , Tausch.	<i>Dermasea</i> , Haw.	<i>Eriogyne</i> , Hook.	<i>Blondia</i> , Neck.
<i>Antiphylla</i> , Haw.	<i>Arabidia</i> , Tausch.	<i>Lepuropetalum</i> , Ell.	<i>Anthonema</i> , Nutt.
<i>Caliphyllum</i> , Gaud.	<i>Spathularia</i> , Haw.	<i>Cryptopetalum</i> , Hook.	<i>Astilbe</i> , Hamilt.
<i>Aizoonia</i> , Tausch.	<i>Hydatia</i> , Neck.	<i>Chrysosplenium</i> , Tourn.	<i>Hoteia</i> , Morr. et Dec.
<i>Chondrosea</i> , Haw.	<i>Robertsonia</i> , Haw.	<i>Heuchera</i> , Linn.	<i>Orestrophe</i> , Bung.
<i>Cotyledon</i> , Gaud.	<i>Aulaxis</i> , Haw.	<i>Holochloa</i> , Nutt.	
<i>Trigonophyllum</i> , Gaud.	<i>Diptera</i> , Borkh.		

NUMBERS. GEN. 19. Sp. 310.

*Crassulaceæ.*

*Rosaceæ.*

POSITION.—*Cunoniaceæ.*—*SAXIFRAGACEÆ.*—*Lythraceæ.*

*Grossulaceæ.*



O<sub>1000</sub>g. CCXV. HYDRANGEACEAE—Hydrangea.[illegible]

DIAGNOSIS.—*Sacifragul* *Europae*, with distinct styles and typical horns without spines.

Shrubs with perfectly opposite simple leaves, smooth or downy, with simple veins destitute of stipules; sometimes creeping and rooting like Ivy. Flowers usually axillary, those in the centre of the branch, the marginal often sterile and furnished with larger petals than the others. Calyx adhering more or less to the ovary, 4-6-toothed. Petals 4-6, inserted within the edge of the calyx, deciduous. Stamens 3-12 in 2 rows, or 00, inserted in the orifice of the calyx, distinct, deciduous. Anthers oblong or roundish; pollen with 3 longitudinal furrows. Ovary more or less adherent to the calyx, consisting of from 2 to 5 carpels, adhering by their sides and forming an incompletely 2-5-celled cavity; placentæ distinct from each other, but touching, with many anatropal ascending or horizontal ovules; styles as many as the carpels, perfectly distinct, diverging, with simple reniform stigmas. Fruit a capsule crowned by the permanent diverging styles, 2-5-celled, with a number of minute seeds, sometimes indefinite, sometimes few, in consequence of the abortion of a part of the ovules. Testa thin, membranous, netted, occasionally expanded into a wing. Embryo orthotropal, in the axis of a small quantity of fleshy albumen.

The relationship between Hydrangeads and Saxifrages is admitted by all systematists, who have in general united them in the same Order. The opposite leaves of the former, the tendency to polygamy, and the crowdedness of their radiant male flowers, and the general increase of supplied female flowers in other good grounds for separating them. Like Saxifrages, *Hydrangea* has a distinct and very often divergent. In some the ovary is entirely separated from the style, in others, as *Hydrangea virens*, it is more than half separated. *Asiaticum*, a curious Japanese genus, has the styles united, and thus forms a transition to *Bauera* on the one hand, and to *Hemlock* on the other. *Saxifraga* and *Deutzia* here, and it may be regarded as a genus bridging the *Philadelphus* and *Bauera* is anomalous in its whorled exstipulate leaves, but hardly be separated, unless it be referred to *Cunoniads*, on the supposition of De-

Siebold and Zuccarini remark that out of the species hitherto discovered, all of which inhabit the temperate parts of Asia and America, twenty belong to the eastern hemisphere, and 23, or about one half, to China and Japan. These include the two, however, include Bauera, but they admit Derris. The species are found generally in moist, shady places.

Fig. CCLXXXIV.—1. Hydrangea corymbosa and its large, round, 3-lobed seed; 2. Hydrangea corymbosa; 3. its seed; 4. a section of it.



February 22, 1905



None of these appear to be of much use to man. Hydrangeas have been cultivated as garden ornaments from the most ancient times in China and Japan. The leaves of *H. Thunbergii* are dried in Japan, and used as a kind of tea, which for its excellence they call Ama-tsja, or Tea of Heaven. Another sort of tea is furnished by *Platycrater arguta*.—*Siebold*.

# GENERA.

<i>Hydrangea</i> , L.	<i>Cardiandra</i> , S. et Z.	<i>Cornidia</i> , R. P.	<i>Adamia</i> , Wall.
<i>Hortensia</i> , Juss.	<i>Platycrater</i> , S. et Z.	<i>Sarcostyles</i> , Presl.	<i>Cyanitis</i> , Reinw.
<i>Peautia</i> , Comm.	<i>Schizophragma</i> , S. et Z.	<i>Broussaisia</i> , Gaud.	<i>Bauera</i> , Sm.
<i>Primula</i> , Lour.	<i>Jamesia</i> , Torr. et Gr.		

# NUMBERS. GEN. 9. Sp. 45.

*Philadelphaceæ.*

POSITION.—*Saxifragaceæ.*—HYDRANGEACEÆ.—*Cunoniaceæ.*  
*Caprifoliaceæ.*

HYDRANGEACEÆ, (*Lindl. in Bot. Reg. 20, fol. 1686. (July 1834); Martius Conspectus, No. 77; Ed. pr. cxxiv.; Endl. Gen. p. 291.*) Trees, with the habit and inflorescence of *Myrobalans*. Leaves opposite, entire, without stipules. Wood regularly zoned, with very abundant vasiform tissue (dotted ducts). Flowers by abortion ♂ ♀. Calyx 5-parted, lined with a woolly disk, with a valvate æstivation. ♂ Stamens 5, alternate with the sepals, perigynous, long, exserted, inflexed in æstivation; anthers 2-celled, with a broad connective, the lobes oblique, bursting longitudinally. A rudiment of an ovary. ♀ Ovary superior, 2-celled, with very numerous ovules attached horizontally to a placenta in the axis; style cylindrical; stigma obsoletely 2-lobed; ovules with a large conspicuous foramen next the hilum. Fruit a capsule, bursting through the cells into 2 valves. Seeds 00, minute, scrobiform, with the skin drawn to a point and winged on one side, an oblong nucleus, and no albumen. Radicle next the hilum.—After vain attempts at settling the true place of the genus *Henslowia* in the Natural System (see the last edition, No. cxxiv.), some specimens with ripe fruit, for which I am indebted to Mr. Griffith, place the question nearly at rest. The habit of the plant was evidently that of *Viburnum*; but its superior ovary and indefinite ovules forbade any reference to *Caprifoliæ*. But *Hydrangeads* differ from that Order mainly in their indefinite seeds, small quantity of albumen, and constant tendency to produce a superior ovary. *Henslowia* agrees with them still further; the flowers are polygamous, the seeds are winged, which is also the case in *Hydrangea cordifolia* and others; and the albumen is wholly deficient. The chief distinction consists in the complete adhesion of the styles into one undivided cylinder; but among *Hydrangeads* we have the same peculiarity in *Schizophragma* and *Broussaisia*. On that account, however, *Henslowia* may be regarded as a relation of *Brexia*, but its decidedly opposite leaves are unfavourable to the union of the two in the same Order.—*Henslowia* consists of 3 or 4 species of trees inhabiting the tropical parts of India.—Only Genus. *Henslowia*, Wall. of which *Crypteronia*, Bl. is a synonym, and *Quilonum*, Blanco, according to Planchon.

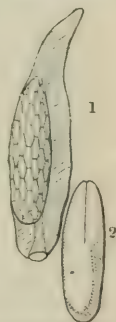


Fig. CCCLXXXV.

Fig. CCCLXXXV.—*Henslowia*. 1. its seed; 2. its embryo.



## ORDER CCXVI. CUNONIACEÆ.—Cunoniaceæ.

Cunoniaceæ, *R. Br. in Phlegon*, 348, 1814; *Don in Bot. Beech. Trans. Linn. Soc. Lond.*, 1825; *Martius Synopsis*, No. 223; *Engelm. bot.*, p. 810.—*Cunoniaceæ*, *Engelm. bot.*, p. 1030.

DIAGNOSIS.—*Santifraga! Liliaceæ*, with distinct stamens, and opposite leaves with large interpetiolar stipules.

Trees or shrubs. Leaves opposite, compound or simple, with stipules bearing petiole-stalks, sometimes united and scale-like, sometimes separate and leafy. Ovary 1 or



FIG. CCCLXXXVI.



FIG. CCCLXXXVII.

5-cleft, half superior or nearly inferior. Petals 4 or 5, occasionally wanting. Stamens polygynous, 4-10, or 100; anthers breaking longitudinally or by pairs. Ovary 1-celled; the cells bearing 2 or many seeds, rarely 4, sometimes combined. Fruit mostly sagu-

lar or indehiscent. Embryo in the axis of fleshy albumen.

This Order is no doubt very distinct from that of Santifragæ, and yet it is more readily distinguished by the widely different habit than by any very important characters in the fructification. The shrubby way of growth, and remarkable compound stipules are the principal character. Don supposed this Order to be most allied to Philadelphæ. The genus *Ochroma*, described in the *Botanical Magazine*, 1810, as agreeing with *Tutsans* in having imbricated sepals, 1-lygynous petals, and numerous partly disjoined carpels, and in some degree in habit, but differing in having distinct stamens (5), stipules, and serrated leaves, but whose fruit is not known, seems upon the whole, to form a member of the Order of Cunoniads.

Natives of the Cape, South America, and the East Indies, common to America.

A *Weinmannia* is used in Peru for tanning leather, and the bark of *W. robusta* is employed to adulterate the Peruvian bark. The Indian *Weinmannia* appears to possess

FIG. CCCLXXXVI.—*Weinmannia robusta*.—Figure 1, branch.

FIG. CCCLXXXVII.—*Ochroma laguncula*.—1, branch of plant; 2, perspective view of the fruit.



similar astringent qualities. Some of the Australasian plants of the Order have a gummy secretion. In general, the pretty appearance of their small white or pink flowers makes them gay objects.

# GENERA.

## I. WEINMANNEÆ.

*Codia*, Forst.  
*Callicoma*, Andr.  
*Calycomis*, R. Br.  
*Aphanopetalum*, Endl.  
*Ceratopetalum*, Smith.  
*Meridema*, Don.  
*Schizomeria*, Don.  
*Tetracarpæa*, Hooker.

*Platylophus*, Don.  
*Anodopetalum*, A. Cunn.  
*Weinmannia*, Linn.  
*Windmannia*, P. Br.  
*Leiospermum*, Don.  
*Ackama*, A. Cunn.  
*Pterophylla*, Don.  
*Arnoldia*, Blum.

*Gumillea*, Ruiz et Pav.  
*Caldcluvia*, Don.  
*Dielerica*, Ser.  
*Cunonia*, Linn.  
*Osterdyckia*, Burm.  
*Geissois*, Labill.  
*Adenilema*, Blum.  
*Pellacalyx*, Korth.

*Ochranthe*, Lindl.

## II. BELANGEREÆ, Gardn.

*Belangera*, Camb.  
*Polystemon*, Don.  
*Lamanonia*, Fl. Fl.  
*Raleighia*, Gardn.

NUMBERS. GEN. 22. Sp. 100.

POSITION.—Hydrangeaceæ.—CUNONIACEÆ.—Saxifragaceæ.  
*Philadelphaceæ.*

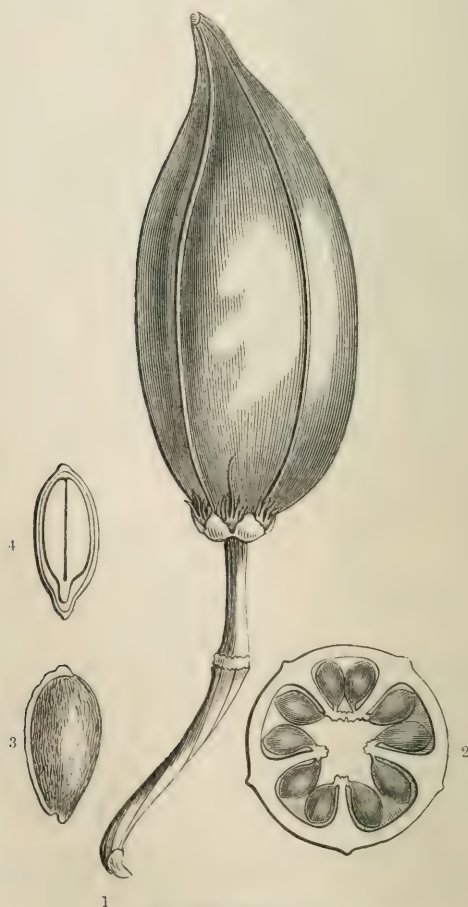


Fig. CCCLXXXVIII. bis.

Fig. CCCLXXXVIII. bis.—1. fruit of *Brexia madagascariensis*; 2. a cross section of it; 3. a seed; 4. the same divided perpendicularly.



## Group CCXVII. BENZYL 4-HYDROXY-

BRIDGES, E. J. *Phylos. N.* (1948) 1891. *Journal of the British Ecological Association*, 58, 1891-1900.  
No. 267. (1949). *Phylos. N.* p. 1923. (1950). *Phylos. N.* p. 1923. (1951). *Phylos. N.* p. 1923.

DIAGNOSIS.—*Staphylopus Europæus*, with *capitulum* wider, a *subcapitulum* with  
*hairs*, and *antennæ*.

Trees, with nearly simple trunks. Leaves coriaceous, alternate, ovate, serrate, with deciduous minute stipules. Flowers green, in axillary cymes; calyx brown.



Fig. CCCLXX XVIII

small, persistent, 4-parted; a division be-  
eared. Petals 5, large, ovate, persistent. Stam-  
ination. Stamens 5, long, cylindrical, with  
with the petals, arising from a narrow tube,  
which is toothed externally; each stamen an-  
thers oval, innate, 2-celled, bursting longitudi-  
nally, fleshy at the apex; anthers orange,  
coloring by means of fine threads. Ovary  
superior, 2-celled, with numerous seeds  
attached in two rows to the axis. In the axis  
style 1, continuous; stigma simple. Fruit  
drupaceous, 5-cornered, "marked with nu-  
merous small scarcely elevated papillae like  
the surface of an orange." (p. 104.) Many seeds.  
Seeds indefinite, horizontal, smooth and shi-  
ing, brown, ovate, slightly angular, about the  
size of those of a hazelnut, attached to the axis  
with a double integument, the inner of which  
is membranous; cotyledons ovate, obtuse,  
radicle centripetal; (albumen  
fleshy, according to Theophrastus.

There exists in Madagascar a genus called *Brexia*, of which the above is a description taken in part from the living plant, and in part from Dr. Wallich, in the *Flora Boiss.* 2: 184. The position which this plant ought to occupy

in a natural classification is unsettled. Indeed, we are not certain whether the seeds have albumen; for although Thouars states it to be fleshy, Dr. Walp. is silent upon the subject, and no other Botanist seems to have examined the seeds. The fruit is that of some Ardisiads, especially of Theophrasta, from which it differs in being polypetalous, the stamens being alternate with the petals, and in many other circumstances. With Rhamnals and Spindle-trees its relation is no doubt strong, but the seeds are indefinite. Some resemblance may be traced between it and Anacardiaceae, especially in the resinous appearances visible upon the young shoots, and also in the mode of fructification is entirely at variance with that Order. With Pittosporaceae it agrees in its hypogynous definite stamens, its polyspermous fruit, its alternate undivided leaves, and habit; but it is probable that the embryo is not such as before that Order. And Icher places it at the end of Saxifragas, combining with it *Excoecaria* and *Alnus*; perhaps the latter a genus having the ovary adherent in some degree to the calyx. My own approximation is right,—and it certainly seems probable, and if the seeds of *Excoecaria* should prove, when re-examined, to have albumen, as Thouars says, and the perisperm reticulated testa represented by Gartner, then *Excoecaria* must be joined to *Alnus* in form, and may be looked upon as a genus of the Saxifragal Alliance, where it appears best to place it for the present. Nor can I doubt that *Hamamelis*, treated by Fendler in his *Iconographia*, is of the same class, notwithstanding its opposite leaves. Its ovary is quite analogous to the toothed disk of *Brexia*.

## GENERAL

Iverba, *A. Conn.*  
Brevia, *Thomars.*

*[Faint, illegible text]*

Arzoumanian, 1996]

108

NUMERUS, GEN. 1. SP. 6

*Chester*

POSITION, — — — — — BREXING — — — — —

My dear Mr. ...

Fig. CCCXXXVIII. 1. B. *serotina* (young); 2. *serotina* (adult); 3. *serotina* (old); 4. *serotina* (very old).



## ORDER CCXVIII. LYTHRACEÆ.—LOOSESTRIFES, OR LYTHRADS.

*Salicariæ*, Juss. Gen. 330. (1789); *Lindl. Synops.* 71; *Aug. de St. H. Ann. Sc. Nat.* 2. ser. 1. p. 1. and 333.—*Calycanthemæ*, Vent. Tabl. 3. 298. (1799).—*Salicariæ*, Link Enum. 1. 142.—*Lythariæ*, Juss. Dict. Sc. Nat. 27. 453.; *DC. Prodr.* 3. 75; *Endl. Gen. cclxvii.*; *Meisner Gen.* p. 117.

DIAGNOSIS.—*Saxifragal Exogens*, with consolidated styles, a tubular permanent calyx with the petals in the margin, opposite leaves, and no albumen.

Herbs, rarely shrubs. Branches frequently 4-cornered. Leaves opposite, seldom alternate, entire, without either stipules or glands, sometimes with glandular dots.

Flowers solitary or clustered, regular or irregular, axillary or in terminal spikes or racemes, in consequence of the depauperation of the upper leaves. Calyx monosepalous, tubular, ribbed, often oblique, the lobes with a valvate or separate æstivation, their sinuses sometimes lengthened into other lobes. Petals inserted between the outer lobes of the calyx, very deciduous, sometimes wanting. Stamens inserted into the tube of the calyx below the petals, to which they are sometimes equal in number; sometimes twice, or even four times as numerous; anthers adnate, 2-celled, opening longitudinally. Ovary superior, 2-6-celled, occasionally only 1-celled; ovules 00, rarely definite, ascending or horizontal, anatropal, attached to axile or dissepimental placenta, having a central origin; style filiform; stigma usually capitate. Capsule membranous, covered by the calyx, dehiscent. Seeds numerous, small, without albumen, adhering to a central placenta; embryo straight; radicle turned towards the hilum; cotyledons roundish, flat, and leafy.

The true place of this Order has been the subject of much difference of opinion. A writer in the *Linnaea* (14. 254) refers it without any doubt to the vicinity of House-leeks (*Crassulaceæ*). In some respects the Order resembles *Onagrad*, from which the superior ovary and many-ribbed calyx distinguish it; also *Melastomads*, from



Fig. CCCLXXXIX.

which the superior ovary, the veining of the leaves, and the æstivation of the stamens divide it. With *Labiates* it has often a similarity in habit, but this goes no further. A resemblance to *Spindle-trees* is established by the genus *Adenaria*. Endlicher even

Fig. CCCLXXXIX.—*Diplusodon arboreus*.







## ALLIANCE XLIV. RHAMNALES.—THE RHAMNAL ALLIANCE.

DIAGNOSIS.—*Perigynous Exogens, with monodichlamydeous flowers, consolidated carpels, axile placentæ, capsular, berried, or drupaceous fruit, definite seeds, and an amygdaloid embryo, with little or no albumen.*

It has already been stated that the only positive distinction between this Alliance and Daphnals consists in the compound ovary of Rhamnals. This may seem a trifling difference and quite artificial. But in reality it is connected with a higher evolution of all the parts, as is indicated by the general presence of a corolla, which even becomes monopetalous, and by its considerable development in many instances. Even in Sarcocollads, where the corolla is missing, the calyx acquires quite a petaloid condition.

Storaxworts pass directly into Ebenads, with which the next Alliance commences. In general the smallness of the embryo and the largeness of the albumen in the latter, completely divide them from Rhamnals; but some Ebenads have quite an intermediate structure, and are not very easy to distinguish from Storaxworts.

## NATURAL ORDERS OF RHAMNALS.

- |  |   |                     |
|--|---|---------------------|
| <i>Flowers apetalous. Ovary composed of 4 carpels. Calyx tubular, with definite divisions. Cotyledons rudimentary. . . .</i>                     | } | 219. PENEACEÆ.      |
| <i>Flowers apetalous. Ovary composed of 2 carpels. Calyx tubular, with a definite number of divisions. Cotyledons amygdaloid . . . . .</i>       |   |                     |
| <i>Flowers apetalous. Ovary composed of 2 carpels. Calyx imperfect, and irregularly divided at the edge. Cotyledons thin and leafy . . . . .</i> | } | 221. ULMACEÆ.       |
| <i>Flowers polypetalous. Calyx valvate. Stamens opposite petals. Seeds erect . . . . .</i>   |   |                     |
| <i>Flowers polypetalous. Calyx valvate. Stamens alternate with petals. Seeds pendulous . . . . .</i>   | } | 223. CHAILLETIACEÆ. |
| <i>Flowers polypetalous. Calyx imbricated. Stamens (3) monadelphous . . . . .</i>  |   |                     |
| <i>Flowers polypetalous. Calyx imbricated. Stamens (5) distinct . . . . .</i>  | } | 225. CELASTRACEÆ.   |
| <i>Flowers monopetalous. Stamens episealous . . . . .</i>  |   |                     |
| <i>Flowers monopetalous. Stamens epipetalous. Ovules ascending. Radicle short. Cotyledons amygdaloid . . . . .</i>                               | } | 227. SAPOTACEÆ.     |
| <i>Flowers monopetalous. Stamens epipetalous. Ovules, in part at least, suspended. Radicle long. Cotyledons leafy . . . .</i>                    |   |                     |
|  | } | 228. STYRACACEÆ.    |
|  |   |                     |

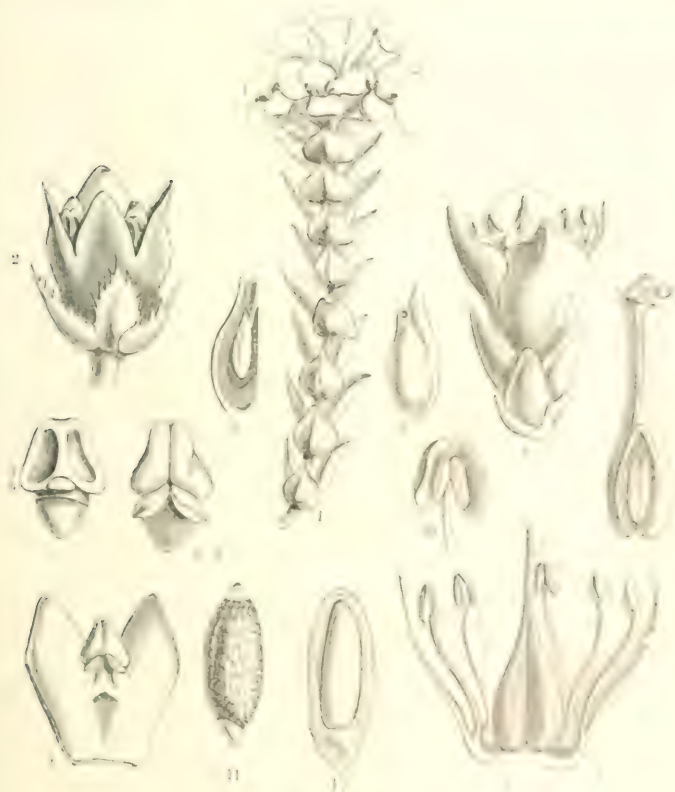


## ORDER CCXIX. PENTACEPHALUS

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DIAGNOSIS. *Rhizomel Leontide*, with apertures round, on inner margin of 1-3-angulate lobes, with definite striations, and submarginally setiferous.

Shrubs. Leaves opposite, imbricated, without stipules. Flowers terminal or axillary, usually red. Calyx inferior, with 2 or more lobes at its base, 10-merous.


$$T_{\text{max}} = 0.0001 \text{ sec}$$

teriform, with a 4 lobed limb, valvate in outline and in structure. Pharyngeal calyces arising from below the recesses of the limb, each with 2 lobes, the outer of 2 arising from near the base of the calyx; anthers 2-lobed toward bottom, usually with membranous valves lying on the face of a thick body and sometimes with fleshy valves, and an obliterated connective. Heavy corolla, 2-lobed. Tube corolla

Fig. GGCXI-1. S. p. 10. 1 - 100% solution; 2 - 100% solution; 3 - 100% solution; 4 - 100% solution; 5 - 100% solution; 6 - 100% solution; 7 - 100% solution; 8 - 100% solution; 9 - 100% solution; 10 - 100% solution.



style and 4 half-indusiate stigmas; ovules anatropal, either ascending, collateral, in pairs, or solitary and suspended. Fruit capsular, 4-celled, dehiscent or indehiscent? Seed erect or inverted; testa brittle; embryo amygdaloid, exalbuminous, with two very minute cotyledons; hilum fungous.

According to an observation of Jussieu, this Order is allied to Epacrids; but I confess myself unable to perceive in what manner. To me it formerly appeared related to such apetalous dicotyledons as Proteads, with some of which the species agree in habit, and in the case of Stylapterus even in the thickened connective and the structure of the lobes of the stigma, each of which is strikingly like that of a Grevillea. To Bruniads they may be compared, notwithstanding the presence of petals in that Order, for the sake of Linconia, in which the pendulous ovule agrees with Geissoloma, and of the thickened connective of the anthers, which is common to several species, although not present in Geissoloma. The fungous hilum of the seed is similar to that of Milkwords, with which, however, Penæads have no other apparent relation. It is, probably, to Rhamnads that the Order claims the nearest station, for it corresponds with them in the important fact of the stamens being alternate with the valvate lobes of the calyx, when the stamens are of an equal number, and it differs from them principally in its peculiar anthers (and amygdaloid embryo). Its half-indusiate stigmas are like those of some Ericads.

The Order exhibits a singular instance of two distinct kinds of æstivation and attachment of ovules among species which it seems unadvisable to separate from each other. In true Penæa the æstivation is valvate and the ovules ascending, while in Geissoloma the former is imbricate and the latter suspended. Penæa has also tetrandrous flowers, with peculiarly fleshy anthers, while Geissoloma has octandrous flowers, with no peculiar fleshiness in the anthers.

M. Adr. de Jussieu, who has re-examined the Order, finds that the stigmas alternate with the cells of the ovary, in the true Penæads; but that is certainly not the case in Geissoloma. He has also ascertained that the great amygdaloid embryo of Penæa has a minute cleft at one end, indicating rudimentary cotyledons.

All are evergreen shrubs, natives of the Cape of Good Hope, and chiefly to the eastward of the Hottentots Holland chain of mountains.

A sub-viscid, sweetish, somewhat nauseous gum-resin called Sarcocol (*Σαρκοκόλλα*, *Diosc.*) is said to be produced by various species. It was supposed by the Arabians to possess, as its name indicates, the power of agglutinating wounds, and contains a peculiar principle, named Sarcocollin, which has never been detected in any other vegetable matter, and which has the property of forming oxalic acid, being treated with nitric acid. Endlicher, however, remarks that this drug is not likely to be a product of the present Order. Dioscorides says that it was obtained from a Persian tree; but whether that were so or not, the manifest relation of the drug called Sarcocol to Galbanum and Sagapenum, renders it more likely to come from some Umbellifer.

#### GENERA.

Penæa, *L.*  
Sarcocolla, *Kth.*  
Stylapterus, *A. de J.*

Brachysiphon, *Id.*  
Endonema, *Id.*  
Geissoloma, *Lindl.*

NUMBERS. GEN. 6. Sp. 21.

POSITION ————— *Bruniaceæ.*  
— *PENÆACEÆ.* — *Rhamnaceæ.*  
— *Proteaceæ.*



## ORDER CCXX. AQUILARIACEÆ.—A. DC.

Aquilariaceæ, R. Brown, *Comp. p.* 25, (1818). *For. Reson.* 2, (1825). *Trans. Linn. Soc. Lond.* 1825, *Monoc. Gen.* p. 731. *Monocot. Gen.* p. 244, 26.

DIAGNOSIS. *Flowered Euphorbia*, with spreading branches, the ovary composed of 2 capitate, 2-lobed calyx with a definite number of stamens, and unguiculate subgynoecium.

Trees. Branches smooth, with a tough bark. Leaves alternate, or opposite, or short stalks, entire, without stipules. Calyx tuberculate or tubular, 2-lobed, or 5-lobed, segments spreading, persistent, with an indurated insertion; the orifice usually furnished with scales (perianth-stamens). Stamens 10, 8, or 5, in the latter case opposite the segments of the calyx; filaments inserted into the orifice of the calyx a little lower down than the scales. Anthers narrow, oblong, attached by their back below the middle, 2-celled, opening internally and lengthwise. Ovary superior, sessile or stipitate, downy, compressed, 2-celled; ovules two, anatropal, of which one is suspended from each side of the placenta, tapering downwards; style 0, or central and column-shaped; stigma large, simple. Capsule sessile or stipitate, 2-valved or drupaceous, and indehiscent. Seeds one or two, placenta, or one sometimes abortive, pendulous; albumen 0; cotyledons thick, fleshy, hemispherical; radicle straight, superior.

De Candolle places this Order between Chaletiacæ and Anacardæ, but with indications of doubt, and an erroneous character; and Brown seems willing to consider the Order a section of Chaletiacæ, adding, that it would not be difficult to show its affinity to Daphnaceæ. In this I fully concur; in fact, Aquilariads chiefly differ from Daphnads in their dehiscent fruit, composed of two carpels, not one. Both Orders have similar scale-like bodies at the orifice of the calyx, and no perianth, both suspended ovules, a single style, and capitate stigma. This too is the view taken of their affinities by M. Decaisne, who indeed regards them as a mere section of Daphnads, observing that they really differ in nothing except their 2-celled ovary. I would, however, prefer leaving them here, as the group which, in the Rhamnal Alliance, touches the Daphnal.

The species are confined to the tropical parts of Asia.

Aloes-wood, Agila-wood, or Eagle-wood, containing a fragrant resinous substance, of a dark colour, is the trunk of the trunk of the *Aquilaria ovata* and *A. Agallochum*. It is considered a cordial by some Arabian writers, and has been prescribed in gout and rheumatism. For a extensive account of this substance, see *Raphe*, as above quoted.

## GENERA.

<i>Aquilaria</i> , Lam.	<i>Ostrya</i> , Pers. <i>Gen. 10.</i>	<i>Phacelia</i> , Lam.	<i>Chrysanthemum</i> , Pers.
? <i>Ophiospermum</i> , Less.	<i>Dryopteris</i> , Lam.	<i>Phacelia</i> , Lam.	<i>Chrysanthemum</i> , Pers.

NUMBERS. GEN. 5. Sp. 10.

POSITION. Pentacææ—Aquilariaceæ—Chaletiacæ—*Thymelacææ*.

Fig. CCCXII. — *Aquilaria Agallochum*. 1. A branch, 2. The ovary with style, 3. A portion of the capsule.



Fig. CCCXII.



## ORDER CCXXI. ULMACEÆ.—ELMWORTS.

Ulmaceæ, *Mirbel Elém.* 905. (1815); *Lindl. Synops.* 225; *Endl. Gen.* xc.; *Meisn. Gen.* p. 351.—Celtideæ, *Rich., Gaudich. in Freyc. Voy.* 507. (1826); *Endl. Gen.* xci.; *Meisner Gen.* p. 348.

**DIAGNOSIS.**—*Rhamnæ Exogens*, with *apetalous flowers*, an *ovary composed of 2 carpels*, an *imperfect calyx irregularly divided at the edge*, and *thin and leafy cotyledons*.

Trees or shrubs, with rough, alternate, usually deciduous leaves, each having a pair of deciduous stipules at its base. Flowers sometimes by abortion ♀ ♂, in loose clusters, never in catkins. Calyx membranous, imbricated, campanulate, inferior, irregular.

Petals 0. Stamens definite, inserted into the base of the calyx, erect in æstivation. Ovary superior or 2-celled; ovules solitary, pendulous, anatropal, or amphitropal; stigmas 2, distinct. Fruit 1- or 2-celled, indehiscent, membranous or drupaceous. Seed solitary, pendulous; albumen none, or in very small quantity; embryo straight or curved, with foliaceous cotyledons; radicle superior.

The plants of which Elm trees are the representatives assume two appearances, which have led Botanists into the opinion that they constitute two distinct Natural Orders. Of these the Nettle-trees, or Celtææ, have a hard fleshy fruit composed of a single carpel and amphitropal ovules, while the true Elms or Ulmææ have a membranous fruit and anatropal ovules. They are, however, so much alike in most other circumstances, that it seems better to regard them as mere forms of one type, more especially since it seems, from the presence of two stigmas, that even the Celtææ themselves are really furnished with two carpels. It is very unusual to

place Elmworts at a distance from Nettleworts, but I confess that their affinity seems to be much stronger with Rhamnads, of which they have the exact seed.

Natives of the North of Asia, the mountains of India, China, North America, and Europe; in the latter of which countries they form valuable timber-trees.

The inner bark of the Elm is slightly bitter and astringent, demulcent, and diuretic; it has been used in some skin diseases, but it does not appear to possess any important quality. The substance which exudes spontaneously from it is called Ulmin; this is also found in the Oak, Chesnut, and other trees, and, according to Berzelius, is a constituent of most kinds of bark. Elm wood is soft, tough, and coarse, but useful for many rough purposes, especially for water-pipes buried in the ground. The wood of *Planera Abelicea*, the *Pseudosantalum creticum* of the old Pharmacopœias, is aromatic. The young branches of *Celtis australis* are boiled, and the infusion is used against dysentery and blenorrhœa; the fruit is sweetish, and rather astringent; the kernel yields a useful oil. The drupes of *Celtis occidentalis*, the Nettle-tree or Sugar-berry, are administered in the United States in dysentery. The root, bark, and leaves of *Celtis orientalis* are somewhat aromatic, and are employed among eastern nations as a remedy for epilepsy.

## GENERA.

I. CELTÆÆ.—Ovary one-celled; ovules amphitropal.	<i>Sponia</i> , <i>Commers.</i> <i>Solenostigma</i> , <i>Endl.</i> <i>Mertensia</i> , <i>H. B. K.</i> <i>Parasponia</i> , <i>Miq.</i>	II. ULMÆÆ.—Ovary two-celled; ovules anatropal.	<i>Abelicea</i> , <i>Hon. Belli.</i> <i>Zelkova</i> , <i>Spach.</i> <i>Euptelea</i> , <i>Zucc.</i> <i>Microptelea</i> , <i>Spach.</i> <i>Ulmus</i> , <i>Linn.</i>
<i>Celtis</i> , <i>Tournef.</i>		<i>Planera</i> , <i>Gmel.</i>	

NUMBERS. GEN. 9. Sp. 60.

*Urticaceæ.*

POSITION.—Rhamnaceæ.—ULMACEÆ.—Penæaceæ.

*Thymelacææ.*

Fig. CCCXCIII.—*Ulmus campestris*.—*Nees*. 1. its flower; 2. its pistil; 3. its fruit; 4. its embryo.



## ORDER CCXXII. RHAMNACEÆ.—Rhamnales.

Rhamni, Juss. Gen. 376. 1789. — Rhamnacæ, DC. Prodr. 2, 16. 1825. — Rhamnales, Moench, Method. Rhamnacæ, Lath. Gen. critica, 1. Moench, p. 76.

DIAGNOSIS.—*Rhamnal Erogenæ*, with *polypetalous flowers*, of *perianth calyx*, *stamens opposite the petals*, and *ovoid ovules*.

Trees or shrubs, often spiny. Leaves simple, alternate, very seldom opposite; stipules, if any, minute. Flowers small, generally green, axillary or terminal, sometimes ♂ & ♀ by abortion. Calyx 4-5-cleft, valvate. Petals distinct, sometimes



Fig. CCCXCIV.

convolute, inserted into the orifice of the calyx, occasionally 6. Stamens 5, opposite the petals. Disk fleshy. Ovary superior, 2- to 3- or 4-angled; ovules solitary, erect, anatropal. Fruit fleshy and indehiscent, or dry and opening in 3 divisions. Seeds erect; albumen fleshy, seldom wanting; embryo almost as long as the seed, with large flat cotyledons, and a short inferior radicle.

Under this name have been confounded four Orders, very different in themselves, and even in natural affinities, the peculiarities of three of which have been pointed out by Ad. Brongniart in his Memoir upon the subject, and a fourth has been distinguished by myself. These Orders are Rhamnads properly so called, Spargantheæ, Hedyotideæ, and Bladder-nuts the respective affinities of which will be found under each. Brongniart indicates the relation that Rhamnads bear, thus:—If we take the position of stamens as the most important distinction of plants, it will be found they belong to the polypetalous Orders with perigynous stamens. Apple-worts are those to which Rhamnads have the closest relation, agreeing with them in the ovary, the cells of which terminate in number, in the ascending ovules, and in their stamens having usually having two stipules at their base; the number and position of their stamens, and the position of their seeds, separate them widely. But if the position of the stamens is left out of consideration, they will be found to have many characters in common with Urticariads; such as, the aestivation of the calyx, the form of the female sex portion, the position of the stamens in the front of those petals, the structure of the ovary and seedling, &c. important points; the principal differences between them are, in both the stamens being turned outwards in Urticariads, the want in that Order of a disk, in Urticariads stamens, and 2 or more ovules. Sparg-worts are allied to Rhamnads, but the constant separation of sexes in the former Order, their long-persistent stamens, and suspended ovules, are obvious marks of distinction. Hedyotideæ are distinguished, and

Fig. CCCXCIV. — Zeyherus Bactr. 1. A flower, and 2. a fruit. 3. A fruit, and 4. a seed divided vertically.



have abundant albumen, and connect this Order of Rhamnads with Ebenads in the Gentianial Alliance.

It appears from the observations of Mr. Bennett (*Pl. Jav. rar.* 131), that in several genera the raphe of the anatropal seeds is thrown out of its original position next the placenta, by a twist in the cord by which it is attached to the placenta.

Found over nearly all the world, except in the arctic zone. The maximum of species is said to be dispersed through the hottest parts of the United States, the south of Europe, the north of Africa, Persia, and India in the northern hemisphere, and the Cape of Good Hope and New Holland in the southern. Some of the genera appear to be confined to particular countries, as all the true *Ceanothuses* to North America, *Phyllicas* to the Cape, *Cryptandra* and *Pomaderris* to New Holland.

The berries of various species of *Rhamnus* are violent purgatives, and have been highly spoken of in dropsy. They also yield a dye, varying in tint from yellow to green; the ripe berries of *R. catharticus*, mixed with gum-arabic and lime-water, form the green colour known under the name of Bladder-green. The French Berries of the shops (*Graines d'Avignon, Fr.*) are the fruit of *R. infectorius*, *saxatilis*, and *amygdalinus*. Those of *R. infectorius*, when unripe, are used by the modern Greeks to dye morocco leather yellow. The fruit of *Zizyphus* is destitute of these purgative qualities, and on the contrary, is often wholesome and pleasant to eat, as in the case of the Jujube, *Zizyphus vulgaris* and *Jujuba*, the *Zizyphus Cnopia* and *Z. Joazeiro*, whose drupes are used in Brazil as Jujubes. The Lote-bush, which gave its name to the Ancient Lotophagi, is to this day collected for food by the Arabs of Barbary, who call it *Sadr*, and its berries *Nabk*; it is the *Zizyphus Lotus* of Botanists. Many other species are also fit for food, among which, in Afghanistan, the *Maimunna* must be named. This is in some repute for its fruit, which is a sweetish black berry the size of a currant. Its genus has not been ascertained.—*Griffith*. The peduncles of *Hovenia dulcis* become extremely enlarged and succulent, and are in China a fruit in much esteem, resembling in flavour, as it is said, a ripe Pear. Some species are astringent. *Sageretia theezans* is used for tea by the poorer classes in China; an infusion of the twigs of *Ceanothus americanus* has been named as useful, on account of its astringency, to stop gonorrhœal discharges; antisiphilitic virtues are ascribed to the root of the same, and also of *Berberia volubilis*; and it is said by Rumphius, that in the Moluccas the bark of *Zizyphus Jujuba* is employed as a remedy for diarrhœa. See *Royle's Illustrations*, p. 169. The Quina of Brazil is the *Discaria febrifuga*, whose acrid root is employed in the form of extract as a febrifuge and tonic. The bark of *Zizyphus Joazeiro* is bitter and astringent, with some acidity, and produces sickness.—*Martius*. Similar qualities have been recognised in various other species. The kernels of *Zizyphus soporiferus* are sedative, according to the Chinese, who employ them in their medicine. The negroes of the Gambia prepare a wine from the fermented berries of *Zizyphus orthacanthus*; but those of *Z. Baclei* are regarded as poisons.

The bitter bark of *Colubrina* Fermentum is said to bring on violent fermentation in the liquors into which it is thrown. *Gouania domingensis* is stomachic; *Berberia lineata* a hydragogue, according to Chinese authors. Finally, the root of *Zizyphus Napcea* is used as a remedy for windy colic. In Abyssinia the leaves of *Rhamnus pauciflorus* or *Guécho* are used like hops in the preparation of beer; and in the same country the bitter fruit of *Rhamnus Staddo* is employed in like manner.

#### GENERA.

<i>Ventilago</i> , Gärtn.	<i>Scutia</i> , Commers.	<i>Ochetophila</i> , Pöpp.	<i>Nägelia</i> , Zolling.
<i>Paliurus</i> , Tournef.	<i>Sentis</i> , Commers.	<i>Retanilla</i> , Brongn.	<i>Trymalium</i> , Fenzl.
<i>Aspidocarpus</i> , Neck.	<i>Sarcophthalmus</i> , P. Br.	<i>Mollinea</i> , Commers.	<i>Gouania</i> , Jacq.
<i>Microrhamnus</i> , A. Gray.	<i>Noltea</i> , Reichenb.	<i>Talguenea</i> , Miers.	<i>Retinaria</i> , Gärtn.
<i>Zizyphus</i> , Tournef.	<i>Vittmannia</i> , Wight.	<i>Trevoa</i> , Gill.	<i>Reissekia</i> , Endl.
<i>Condalia</i> , Cav.	<i>Willenetta</i> , Brongn.	<i>Walpersia</i> , Reiss.	<i>Helinus</i> , E. M.
<i>Berberia</i> , Neck.	<i>Sarcophthaloides</i> , DC.	<i>Trichocephalus</i> , Reiss.	<i>Willmetia</i> , E. Z.
<i>Cnopia</i> , Schult.	<i>Ceanothus</i> , Linn.	<i>Tylanthus</i> , Reiss.	<i>Crumenaria</i> , Mart.
<i>Sageretia</i> , Brongn.	<i>Forrestia</i> , Raf.	<i>Petalopogon</i> , Reiss.	? <i>Solenanthes</i> , G. Don.
<i>Hovenia</i> , Thunb.	<i>Cormonema</i> , Reiss.	<i>Phyllica</i> , Linn.	? <i>Schæfferia</i> , Jacq.
<i>Rhamnus</i> , Juss.	<i>Arabidea</i> , Steud.	<i>Tylanthus</i> , Reiss.	? <i>Samara</i> , Linn.
<i>Alaternus</i> , Tournef.	<i>Colubrina</i> , L. C. Rich.	<i>Soulangia</i> , Brongn.	? <i>Daphniphyllum</i> , Blum.
<i>Marcocrella</i> , Neck.	<i>Tubanthera</i> , Commers.	<i>Spyridium</i> , Fenzl.	? <i>Galdicia</i> , Neraud.
<i>Cervispina</i> , Dill.	<i>Alphitonia</i> , Reiss.	<i>Cryptandra</i> , Smith.	? <i>Quoia</i> , Neraud.
<i>Cardiolepis</i> , Raf.	<i>Colletia</i> , Commers.	<i>Pomaderris</i> , Labill.	? <i>Carolinia</i> , Neraud.
<i>Frangula</i> , Tournef.	<i>Discaria</i> , Hook.	<i>Pomatoderris</i> , Schult.	
<i>Karwinskia</i> , Zucc.	<i>Adolphia</i> , Meisn.		

NUMBERS. GEN. 42. Sp. 250.

*Aquifoliaceæ.*

POSITION.—*Celastraceæ*.—*RHAMNACEÆ*.—*Chailletiaceæ*.

*Buttneriaceæ.*



## ORDER CCXXIII. CHAILLETIACEÆ.—CHAILLETIACEÆ.

Chailletia, R. Braen Cong. p. 23. 1818. — Chailletaceæ, DC. Prodr. 2. 37. 1825. — Chailletia, R. Br.

DIAGNOSIS.—*Rhamnal Exogens, with polypetalous flowers, a valvate calyx, a superior ovary, stamens alternate with the petals, and pendulous seeds.*

Trees or shrubs. Leaves alternate, with two stipules, decurrent, entire. Flowers small, axillary, fasciculate or corymbose, their pedicels often ciliate with the petals.

Sepals 5, with an inverted valvate aestivation. Petals 5, alternate with the sepals, and arising from the base of the calyx, usually 2-lobed. Stamens 5, alternate with the petals, and combined with them at the base; anthers ovate, versatile. Gynoecium usually 5, hypogynous, opposite the petals. Ovary superior, 2- or 3-celled; ovules twin, pendulous; style single; stigma obconically 5-lobed. Fruit drupaceous, rather dry, 1- 2- or 3-celled. Seeds adnate, pendulous, naked or arillate, without albumen; embryo thick, with a thick superior radicle and fleshy cotyledons.

Whether what are here called petals are not rather adaptive stamens is doubted by Benth., and hence the station of the Order is compared, on the one hand, with Anacards or Rosaceæ, and on the other, with Samyds and Masticææ. To me it seems that what appears to be petals are so; and that which it is difficult to doubt, when it is remembered that both calyx and corolla are mere modifications of one part.



Fig. CCCXCV.

mon type, and that it is in position only that they differ. Dr. Chailletia occupies the Order between Homaliads and Aquilariads: it agrees with the latter in the presence of glands round the ovary, but differs in its superior ovary with the pendulous ovules on the axis, and many other characters. Rhamnads, with which it corresponds in shape of habit, seem, however, upon the whole to claim the closest kindred with it, and it can hardly be regarded in any other light than as a member of the Rhamnal Alliance. It will then be stationed in the neighbourhood of Elmworks, which some Botanists are convinced is its true position. Its valvate calyx separates it from Hippocrateæ, its pendulous ovules and stamens alternate with the petals, from Rhamneæ.

Of the few known species belonging to this Order, 2 are found in Sierra Leone, 1 in Madagascar, 2 in equinoctial America, and 1 in Timor.

The fruit of Chailletia toxicaria is said to be poisonous: it is called Bitchberry in Sierra Leone.

GENERA.

Moneurua, Rorb.	Symphylæthra, Vahl.	Tetraglochin, Thunberg.
Waldenburgeria, R. Br.	Mestotes, Soland.	Leucocarpus, Thunberg.
Chailletia, DC.	Patrisia, Rorb.	Phyllanthus, Rorb.

NUMBERS. GEN. 4. Sp. 10.

Symphyllæthra.

POSITION.—Ulmaceæ.—CHAILLETIACEÆ.—Rhamnaceæ.

Hippocrateæ.

Fig. CCCXCV. — Chailletia pedunculata. Part. 1. a flower of Moneurua leucantha; 2. a portion of a flower; 3. a stamen; 4. the pistil; 5. a vertical section of the ovary of Moneurua; 6. a section of the ovary of Chailletia; 7. a section of the ovary of Moneurua; 8. a section of the ovary of Chailletia.



## ORDER CCXXIV. HIPPOCRATEACEÆ.—HIPPOCRATEADS.

Hippocrateaceæ, *Juss. Ann. Mus.* 18, 183. (1811).—Hippocrateaceæ, *Knuth in Humb. N. G. Am.* 5, 136. (1821); *DC. Prodr.* 1, 567; *Endl. Gen.* cccxxvii.; *Meisner*, p. 56; *Wight. Illustr.* 1, 132.

DIAGNOSIS.—*Rhamnal Exogens*, with polypetalous flowers, an imbricated calyx, and 3 monadelphous stamens.

Arborescent or climbing shrubs, which are almost always smooth. Leaves opposite, simple, entire or toothed, somewhat coriaceous, with small deciduous stipules. Racemes axillary, in corymbs or fascicles. Flowers small, inconspicuous. Sepals 5, very small, imbricated, combined as far as the middle, persistent. Petals 5, somewhat imbricated in æstivation. Stamens 3; filaments cohering almost as far as the apex into a tube dilated at the base, and forming about the ovary a thick disc-like cup; anthers opening transversely at the apex. Ovary free, concealed by the tube, 3-celled; style 1; stigmas 1-3; ovules ascending; anatropal or half anatropal. Fruit either consisting of 3 samaroid carpels, or berried, with from 1 to 3 cells. Seeds in each cell definite, attached to the axis in pairs, some of them occasionally abortive, sometimes buried in pulp, erect without albumen; embryo straight; radicle pointing towards the base; cotyledons flat, elliptical oblong, somewhat fleshy, cohering when dried.

The ternary number of the stamens, combined with pentamerous petals and sepals, is the prominent characteristic of this Order, which was formerly included among Maples by Jussieu, which is placed between *Erythroxyls* and *Marcgraaviads* by De Candolle, but which is, to all appearance, much more nearly re-



Fig. CCCXCVI.

lated to Spindle-trees, as Brown has remarked; for "the insertion of the ovules is either towards the base, or is central; the direction of the radicle is always inferior."—*Congo*, 427. In fact there seems to be nothing to divide Hippocrateads from Spindle-trees except the cohesion of the filaments of the former into a cup. The samaroid fruit, which is so remarkable, and which connects the Order with Malpighiads, is not universal, but merely characteristic of certain genera. In Hippocratea ovata the testa and cotyledons are furnished in the inside with innumerable spiral threads; the same economy has been remarked by Du Petit Thouars in the pericarp of Calypso. According to Endlicher, the genera *Elæodendron* and *Ptelidium* among Spindle-trees connect that Order with Hippocrateads.

The principal part are South American, about one-seventh are natives of Africa or the Mauritian Islands, and the same number has been recorded as East Indian.

The fruit of *Tontelea* (*Salacia*) *pyriformis*, a native of Sierra Leone, is eatable. It is about the size of a Bergamot Pear; its flavour is rich and sweet. The nuts of Hippocratea comosa are oily and sweet; it is called, in the French West India Islands, *Amandier du Bois*. Martius reports that several species of *Tontelea*, called *Saputá* in Brazil, have a sweet mucilaginous fruit, which is eaten. I find no indication here of the emetic and nauseous quality recorded as being characteristic of Spindle-trees.



## GENERA

Hippocratea, Lam.

Hippocratea, Lam.

Hippocratea, Lam.

Hippocratea, Lam.

Hippocratea, Lam.

Hippocratea, Lam.

Hippocratea, Lam.

Hippocratea, Lam.

Hippocratea, Lam.

Cera, Poir.

Dioscorea, Lam.

Dioscorea, Lam.

Dioscorea, Lam.

Numerous. Cera, Poir.

Mycophaga

Position.—Charlottesville.—Hippocratea, Lam.

Dioscorea



## ORDER CCXXV. CELASTRACEÆ.—SPINDLE-TREES.

Celastrineæ, *R. Brown in Flinders*, 22. (1814); *DC. Prodr.* 2. 2.; *Ad. Brongniart Mémoire sur les Rhamnées*, 16.; *Endl. Gen.* cccxxvi.; *Meisner Gen.* p. 68.; *Wight Illustr.* 1. 174.; *Arn. in Ann. Nat. Hist.* 3. 153.

DIAGNOSIS.—*Rhamnial Exogens*, with *polypetalous flowers*, an *imbricated calyx*, and *stamens* ( $\sqrt{}$ ) *distinct*.

Small trees or shrubs. Leaves alternate, seldom opposite, simple, with very small deciduous stipules. Flowers in axillary cymes, small, green, or white, or purple,

occasionally ♂ ♀ by abortion. Sepals 4 or 5, imbricated, inserted into the margin of an expanded disk. Petals inserted by a broad base, under the margin of the disk, with an imbricate æstivation; sometimes 0. Stamens alternate with the petals, inserted into the disk, either at the margin or within it; anthers innate. Disk large, expanded, flat, closely surrounding the ovary, covering the flat expanded calyx. Ovary immersed in the disk and adhering to it, with 2 to 5 cells; cells 1- or many-seeded; ovules ascending from the axis, anatropal, attached to a short funiculus. Fruit superior, 2- to 5-celled, either capsular or drupaceous. Seeds ascending, seldom inverted by resupination, either provided with an aril, or without one; albumen fleshy; embryo straight; cotyledons flat and thick, with a short inferior radicle.

Formerly confounded with Rhamnads, this Order was first separated by Brown, who distinguished it particularly by the relation which its stamens bear to the petals. It also differs in its imbricated calyx, and in its disk being hypogynous. According to Brongniart, Spindle-trees have more relation to several Orders with hypogynous stamens than to any with perigynous ones, especially to



Fig. CCCXCVII.

Malpighiads, to which they are related through Hippocrateads; a considerable resemblance with such Spurgeiworts as *Phyllanthus* may also be traced; and Hollyiworts have been principally established upon dismemberments of the present Order. Nevertheless, the distinctions between it and both Spurgeiworts and Hollyiworts are easy to



traces; for the former are constantly hollow, and the latter monophloemous; hence which, the radicle of *Spindle-tree* is inferior, that of *Sparganium* superior, with an albumen of Hollyworts is extremely capacious, while that of *Spindle-tree* is comparatively inconsiderable in quantity. The drupaceous genera forming the *Elæagaceæ* will, order, establish an affinity with Sapotaceæ, which have, however, a membranous corolla and milky juice, and most numerous, while those which are fleshy, present a number the segments of the corolla are opposite to the latter. *Elæodendron* bears a resemblance with Pittosporaceæ, and finally adds that all the *Elæagaceæ* genera have greatly in need of more careful examination.

According to M. Planchon, the arillus of *Eucynosa* is a pericarp separating off the exostome, and is not derived from the placentæ.

The species are natives of the warmer parts of Europe, North America, and Asia, but far more abundant beyond the tropics than within them; a great number of species inhabit the Cape of Good Hope. Some are found in China and Java, and a few in New Holland.

Royle mentions an acrid principle having been detected among the species, which acts with more or less activity; and that the seeds of several yield an oil which is useful for burning. That of *Celastrus nutans* or *patens*, latus is said in India to be of a stimulant nature, and to be used in medicine in the disease called *Beriberri*. The bark of *Euonymus tingens* is in the inside of a beautiful light-yellow colour, similar to that of some species of *Rhamnus*; it is used to mark the tika on the forehead of Hindoos, and might be employed as a dye. It is also considered useful in diseases of the eye. The leaves of *Catha edulis*, *Kat* or *Khat* of the Arabs, would appear to be of a stimulating nature. According to Forskahl, the Arabs eat the green leaves with greediness, believing them to have the power of causing extreme watchfulness, so that a man may stand sentry all night long without drowsiness. They also regard it as an antidote to the plague, and assert that a person wearing a twig of it in his bosom, may go among the infected with impunity. They even believe that the plague cannot appear in a place where the tree is cultivated. Nevertheless, says Forskahl, "the taste of the leaves does not seem to indicate such virtues." Botta also says that, when fresh, the *Khât* leaves are very intoxicating. The fresh bark of the root of *Elæodendron Roxburghii*, rubbed with plain water, is by the natives of India applied externally to almost every sort of swelling. It is a very strong astringent, possessing scarcely any other sensible quality.—*Roch.* Similar qualities are attributed to *Maytenus chilensis*. The seeds of the European species of *Euonymus* are nauseous, and said to be purgative and emetic; sheep are said to be poisoned by them; an ointment was formerly prepared from them for the destruction of pediculi in the head. Similar qualities have been found in the bark of *Colletia floribunda* and *senegalensis*; while the spines of *Celastrus scandens* are reported to inflict most painful wounds. The drupes of *Elæodendron Kuhn* are eaten by the natives of the Cape and used there



FIG. CCXCVIII.



FIG. CCXCIX.

FIG. CCXCVIII.—*Celastrus paniculatus*, L. 1. a cross section of the ovary; 2. a longitudinal section of the ovary; 3. a longitudinal section of the fruit; 4. a perpendicular section of a seed.

FIG. CCXCIX.—*Euonymus europæus*, L. 1. a cross section of the ovary; 2. a longitudinal section of the ovary; 3. a longitudinal section of the fruit; 4. a perpendicular section of a seed.



## GENERA.

I. EUONYMEÆ. — Fruit capsular.	<i>Hæneke</i> , Ruiz. et Pav.	<i>Hartogia</i> , Thunb.	<i>Crossopetalum</i> , P. Br.
	<i>Microtropis</i> , Walt.	<i>Schrebera</i> , Thunb.	<i>Pachystima</i> , Raf.
<i>Putterlickia</i> , Endl.	<i>Pterocelastrus</i> , Meisn.	<i>Elæodendron</i> , Jacq.	<i>Oreophila</i> , Nutt.
<i>Lophopetalum</i> , Wight.	<i>Asterocarpus</i> , Eckl. et Zeyh.	<i>Portenschlagia</i> , Tratt.	? <i>Bhesa</i> , Hamilt.
<i>Evonymus</i> , Tournéf.		<i>Lamarckia</i> , Hort.	<i>Kurrinia</i> , Wall.
<i>Polycardia</i> , Juss.		<i>Nerija</i> , Roxb.	? <i>Actegiton</i> , Blum.
<i>Florinda</i> , Noronh.	II. ELÆODENDREÆ. —	<i>Skytophyllum</i> , Eckl. et Zeyh.	? <i>Tralliana</i> , Lour.
<i>Commersonia</i> , Comms.	Fruit drupaceous.		? <i>Lepta</i> , Lour.
<i>Catha</i> , Forsk.	<i>Ptelidium</i> , Thouars.	<i>Lauridia</i> , Eckl. et Zh.	? <i>Goupia</i> , Aubl.
<i>Sonneratia</i> , Commers.	<i>Seringia</i> , Spreng.	<i>Mystroxydon</i> , Ec. et Z.	<i>Gupia</i> , Jaume.
<i>Celastrus</i> , Kunth.	<i>Wimmeria</i> , Schlecht.	<i>Crocoxydon</i> , Eckl. et Z.	<i>Glossopetalum</i> , Schb.
<i>Maytenus</i> , Juss.	<i>Frauenhoferia</i> , Mart.	<i>Parilla</i> , Dennst.	? <i>Perrottetia</i> , H. B. K.
<i>Maiten</i> , Feuill.	<i>Pleurostylia</i> , Wight et A.	<i>Myginda</i> , Jacq.	? <i>Alzatea</i> , Ruiz. et Pav.
		<i>Rhacoma</i> , Linn.	<i>Alziniana</i> , Dietr.

NUMBERS. GEN. 24. Sp. 260.

*AQUIFOLIACEÆ.*POSITION.—*Sapotaceæ*.—*CELASTRACEÆ*.—*Hippocrateaceæ*.  
*Euphorbiaceæ*.

## ADDITIONAL GENERA.

<i>Senecia</i> , Comm.	<i>Caryospermum</i> , Blume, near <i>Elæodendron</i> .
<i>Monetia</i> , Lam.	<i>Mortonia</i> , A. Gray, near <i>Celastrus</i> .
<i>Balanites</i> , L.	<i>Trigonotheca</i> , Hochst. = <i>Catha</i> .
? <i>Glossopetalum</i> , A. Gray. See <i>Rosaceæ</i> .	

N.B.—*Aquifoliaceæ* differ only in the position of their ovules.—*J. Miers*.A. Richard remarks that, as in France, Cannon gunpowder is made from *Euonymus europæus*, so in Abyssinia it is obtained from the *Celastrus serratus*.



ORDER CCXXVI. STACKHOUSIACEÆ.—*Rhamnaceæ*.Stackhousia. *R. DC. in Prodr., iv. (1830).*—*Stackhousiæ*. *DC. Prodr. (1838).*—*Stackhousia*. *DC. Prodr. (1838).*DIAGNOSIS.—*Rhamnaceæ* *Evangel.*, with *unimpaired flowers*, and *perigynous fruit*.

Herbaceous plants, occasionally somewhat shrubby. Leaves generally entire, alternate, sometimes minute. Stipules lateral, very minute. Spikes terminal, each flower with 3 bracts. Calyx (lobed), 3-lobed, equal, with an inflated tube. Petals 5, equal, arising from the top of the tube of the calyx; their claws combined to a tube longer than the calyx; their limb narrow, stylate. Stamens 5, distinct, unequal (2 alternately shorter), arising from the throat of the calyx. Ovary superior, 3- or 5-celled, the cells partially separated, adhering to a central column, each with a single erect anatropal ovule; styles from 3 to 5, sometimes combined at the base; stigmas simple. Fruit of from 3 to 5 indehiscent, winged, or wingless pieces; column central, persistent. Embryo erect, in the axis of, and almost as long as, the fleshy albumen, with short obtuse cotyledons and an inferior radicle.

This Order should stand between Spindle-trees and Spurge-worts, according to Brown; from the latter of which it differs in the structure of the fruit, and in the position of the seeds, besides other characters; from the former in the presence of stipules, in the cohesion of the petals to a tube, in the deeply lobed ovary, and so on. The hermaphrodite flowers remove the Order, however, from Spurge-worts; its monogamous flowers are much at variance with the structure of Spindle-trees. Nevertheless, the 3-celled ovary, in flowers otherwise pentamerous, is entirely that of Hippocrateads and Spindle-trees, and recalls the Sapindal Affinities, to which all these Orders would be referable if their stamens were not so distinctly perigynous.

A few New Holland shrubs compose all that is known. Their properties are unascertained.

## GENERA.

Stackhousia, *Saville*. | *Tripartita*, *Small*.

NUMBERS. GEN. 2. Sp. 10.

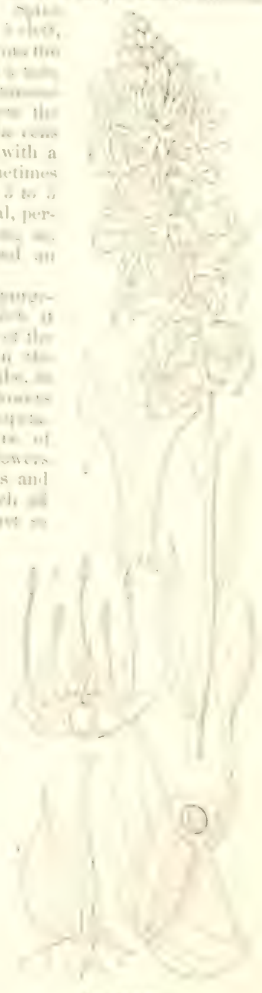
*Stackhousia*.POSITION.—*Celastraceæ*.—*STACKHOUSIACEÆ*.—*Sapindaceæ*.*Evangelista*.

Fig. 1000.

FIG. 1000.—1. *Stackhousia*; 2. its corolla; 3. cross. sec. 4. part of an ovary of *Tripartita*; 5. one of its coel. cut across; 6. an ovule.



## ORDER CCXXVII. SAPOTACEÆ.—SAPOTADS.

Sapotæ, Juss. Gen. 151. (1789).—Sapotææ, R. Brown Prodr. 528. (1810).—Sapotaceæ, Endl. Prodr. Norf. 48. (1833); Gen. clviii.; Meisn. p. 159; Alph. DC. Prodr. 8. 154.

DIAGNOSIS.—*Rhamnal Exogens, with monopetalous flowers, epipetalous stamens, ascending ovules, a short radicle, and amygdaloid cotyledons.*

Trees or shrubs, chiefly natives of the tropics, and often abounding in milky juice. Leaves alternate, or occasionally almost whorled, without stipules, entire, coriaceous. Inflorescence axillary. Flowers hermaphrodite. Calyx regular, persistent, in 5, or occasionally 4-8 divisions, which are either valvate or imbricate in æstivation. Corolla monopetalous, hypogynous, regular, deciduous, its segments usually equal in number to those of the calyx, seldom twice or thrice as many, imbricated in æstivation. Stamens arising from the corolla, in number definite, distinct, the fertile ones equal in number to the segments of the calyx, and opposite those segments of the corolla which alternate with the latter, seldom more; anthers usually turned outwards. The sterile stamens as numerous as the fertile ones, with which they alternate. Disk 0. Ovary superior, with several cells, in each of which is 1 ascending or pendulous anatropal ovule; style 1; stigma undivided, occasionally lobed. Fruit fleshy, with several 1-seeded cells, or by abortion with only 1. Seeds nut-like, sometimes cohering into a several-celled putamen. Testa bony, shining, with a very long scar on the inner face where it is opaque, and softer than the rest. Embryo erect, large, white, usually inclosed in fleshy albumen. Cotyledons, when albumen is present, foliaceous; when absent, fleshy and sometimes connate. Radicle short, straight, or a little curved, turned towards the hilum.

This Order is certainly near Ebenads, with which it agrees in habit, arborescent stem, alternate entire leaves, and axillary inflorescence; and, moreover, in its monopetalous regular hypogynous corolla, the absence of a hypogynous disk, an ovary with several cells, and definite ovules and stamens. The two Orders, however, differ in several points. Sapotads have usually a milky juice, and their wood is among the softer kinds; their flowers are always hermaphrodite; the segments of the calyx and corolla are often placed in a double row; their stamens are always in a single row, the fertile ones rarely more numerous than the segments of the calyx, and opposite the divisions of the corolla; their style is undivided; the cells of the ovary are always 1-seeded, with erect ovules; the testa is thick and bony; the embryo is large with respect to the fleshy albumen, which is sometimes deficient; the radicle is very short and inferior. In Ebenads there is no milk, and the wood is very hard; the flowers are often unisexual by abortion; the segments of the calyx and corolla are almost always in a single row; the stamens are usually doubled, and either twice or four times as numerous as the segments of the corolla, or, if equal to them, alternate with them; the style is generally divided, the cells of the ovary sometimes 2-seeded, the ovules always pendulous, the testa thin and soft, the embryo middle-sized or small in respect to the cartilaginous albumen, which is always present; the radicle is of middling length, or very long and superior. It is worth remarking, that the woody shell of the seed of Sapotads is certainly testa, and not putamen, as is proved by the presence of the micropyle upon it. They are also comparable with Ardisiads, whose abundant albumen and free central placenta render it necessary

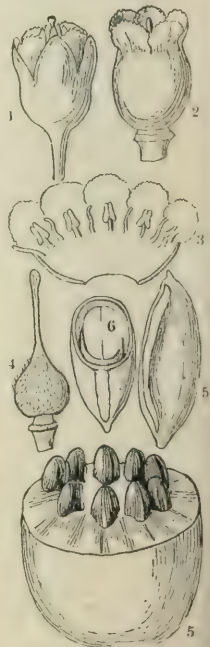


Fig. CCCCI.

Fig. CCCCI.—1. flower of *A. Sapota*; 2. its corolla; 3. the same cut open; 4. the pistil; 5. half a fruit of *Bassia longifolia*; 5, 6. its seed, whole and cut across.



that they should be situated at some distance. They differ being furnished with short radicle and angulished embryo.

Chiefly natives of the tropics of India, Africa, and America; a few are found in the southern parts of North America, and at the Cape of Good Hope.

The fruit of many is enclosed in their native countries in a husk or pericarp, such are the *Sappodilla* Palm (*Asimina* Sapota) and other species, the *Chrysophyllum* (*Cainito*), the *Martyniade* (*Asimina* martyniana), the *Mollia* or *Mollia*, the *Mimusops* *Elongi*, and others; they are thought to be having generally a sweet taste, with a little acidity. The *Billy* or *Billy-tree* of Guinea is a species of *Mimusops* according to Sir R. Schomburgk. The fruit is described to taste of the seed of that berry, and when quite ripe delicious; the seed is solid, heavy, *Chrysophyllum* bears several dessert fruits, as do the *Induraria* *malabarica* and *malabarica*, whose fruit is pale, sweet, and like an Orange in appearance. The seeds of *Asimina* species are purgative and diuretic, but in over-doses they produce severe pain, and are very dangerous; the bark is a substitute for Cinchona; those of some others are used with a camellia oil, which is used for domestic purposes. *Mimusops* *Kaki*, like many trees native to the natives of India. A kind of thick oil, like butter, is obtained from the fruit of *B. butyrica*, the *Mahua* or *Madhuc* tree. The flowers of *B. butyrica* (the *Moring*, *Moring*, *doonah*), are employed extensively in the distillation of a kind of essence, called *Mowra*; they are said to resemble in taste the dried seed of *Opuntia* called *Cactus*. The *Bassia* *longifolia* is called the *Ilupia* tree; its fruit, when green, yields a large quantity of oil used in India for lamps, soap-making, and also the food; it is employed medicinally to cure the itch, and other cutaneous disorders; the leaves boiled in water, as well as the milk of the green fruit and bark, are used in Rheumatic affections. The *Butter-tree* of Mungo Park was also a species of *Bassia*. See *Zeigler's History*, p. 263, for further information concerning these *Bassias*. The tree of a species of *Achras* is so astringent and febri-fugal as to have been substituted for Quinine. The *Cow-tree* of Humboldt has been sometimes supposed to be referable to this Order; but there seems no reason now to doubt its belonging to Artocarpus. *Mimusops* bark is a South American product, with a powerful bitter-sweet taste, largely employed successfully in France in diarrhoea, menorrhagia, leucorrhoea, and hæmorrhoids, which is owing to some plant of this Order. *Plum.*, *Joan.*, 3. 2. 2. The bark of *Bouvillea* *sericea* and *sericea* is bitter, astringent, and febri-fugal, and the wood very hard. The fruit of *B. sericea* is said to be milky; that of *B. lychnodes* austere, with some sweetness, but useful in diarrhoea; while the flowers of *B. graveolens* have a heavy unpleasant odour. The flowers of *Mimusops* *Elongi*, on the contrary, are powerfully aromatic, and a fragrant water is distilled from them. The seeds of this plant yield an abundance of oil, much request for painters, and said to be useful in particular, the seeds are said to produce an extraordinary noise when burnt.

## GENERA

<i>Chrysophyllum</i> , J.	<i>Asimina</i> , Jacq.	<i>Isomandra</i> , W. & A.	<i>Asimina</i> , Jacq.
<i>Asimina</i> , R. & P.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.
<i>Asimina</i> , Tuss.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.
<i>Asimina</i> , Mart.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.
<i>Asimina</i> , Adl.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.
<i>Asimina</i> , L.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.
<i>Asimina</i> , Sw.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.
<i>Asimina</i> , Willd.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.
<i>Asimina</i> , M.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.	<i>Asimina</i> , Jacq.

NUMBERS. GEN. 91. Sp. 911.

POSITION — *Styracaceae* — *Sapotaceae* — *Myrsinaceae*

*Isomandra* *Gutta* is one of the plants which grow on the Florida. The kernel of *Lucuma* *mannosa* furnish prunes and in abundance. A small portion of the kernel, introduced into the stomach or press by mouth, produces violent and coughing. — *Schomb.*

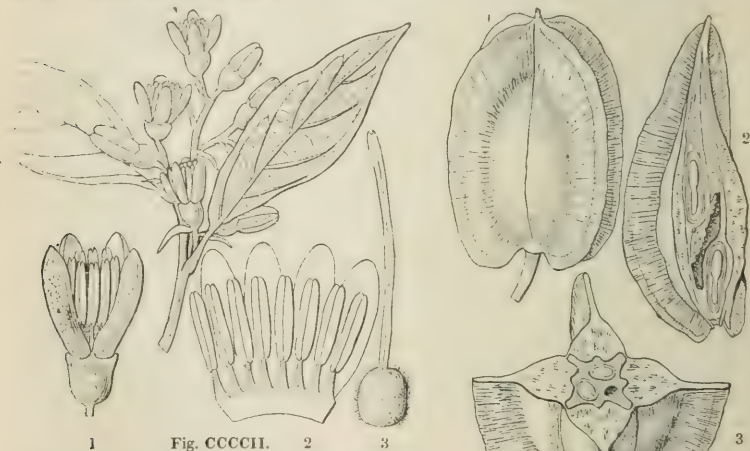


## ORDER CCXXVIII. STYRACACEÆ.—STORAXWORTS.

*Styracæ*, Rich. *Anal. du Fr.* (1808): Von *Martius*, *N. Gen. et Sp. Pl.* 2. 148.; *Endl. Gen.* p. 742; *Meisner*, p. 250.—*Symplocineæ*, Don. *Prodr. Nep.* 144. (1825).—*Styracineæ*, Rich. in *Humb. N. G. et Sp.* 3. 256. (1818).—*Halesiaceæ*, Don in *Jameson's Journ.* (Dec. 1828); *Link Handb.* 1. 667.—*Styracaceæ*, A. DC. *Prodr.* 8. 244. (1844).

**DIAGNOSIS.**—*Rhamnæ* *Exogens*, with *monopetalous flowers*, *epipetalous stamens*, a *part at least of the ovules suspended*, a *long radicle*, and *leafy cotyledons*.

Trees or shrubs. Leaves alternate, without stipules, usually toothed. Flowers axillary, either solitary or clustered, with scale-like bracts. The hairs often stellate.



Calyx inferior (or superior), with 5 (or 4) imbricated divisions, persistent. Corolla monopetalous, the number of its divisions frequently different from that of the calyx; with imbricated æstivation. Stamens definite or indefinite, arising from the tube of the corolla, of unequal length, cohering in various ways, but generally in a slight degree only; anthers innate, 2-celled, bursting inwardly. Pollen broadly elliptical, smooth. Ovary superior, or adhering to the calyx, with from 2 to 5 cells, which are opposite the lobes of the calyx when they are of the same number, the partitions sometimes scarcely adhering in the centre. Ovules anatropal, 2 or 00 in each cell, all pendulous or the upper ascending, the lower pendulous; style simple; stigma somewhat capitate. Fruit drupaceous, surmounted by or inclosed in the calyx, generally with all the cells abortive except one. Seeds ascending or suspended, 5- 1, with the slender embryo lying in the midst of the albumen; radicle long, directed towards the hilum; cotyledons flat.

Those Botanists who attach paramount importance to the condition of the corolla, in deciding upon the relationship of plants, will object to the station now occupied by Storaxworts, which, because of a slight adhesion between the petals, are usually associated with Ebenads. But if a less value is assigned to that character and more to the presence of albumen, then the Storaxworts will fall into the ranks of a different Alliance, in which they will, however, present a distinct tendency towards the Ebenaceous structure. For this reason they are here placed among Rhamnals; while Ebenads are associated with Hollyworts and some other Orders in a neighbouring Alliance.

Such is my own opinion on this subject; the following is the view taken by others. Mr. Bentham would associate them with Ebenads and Humiriads; besides which

Fig. CCCII.—*Styx suberifolium*.—Hooker. 1. a flower; 2. corolla and stamens; 3. pistil.

Fig. CCCIII.—*Halesia tetraptera*.—1. its fruit; 2. a perpendicular; 3. a transverse, section of it.







with a superior radicle directed to the hilum. of the same characters. The plants constituting this group, hitherto placed in *Styracæ*, will be seen to differ widely from that family in many essential particulars, as is shown elsewhere. If we except the cohesion of the calyx with the ovary in the one case, and the presence of the scale-like expansions of the petals in the other, little difference in other respects will be found to exist between them and *Erythroxylaceæ*, which, as in *Symplocaceæ*, are distinguished by stamens generally multiples of the petals, and placed upon a free hypogynous ring, a 3 or 5-locular ovary with suspended ovules, single suspended albuminous seeds with the radicle next the hilum. They have also short axillary racemes growing out of numerous scale-like bracts, and each flower is articulated on its pedicel. By *Barberina* and through *Balanites* they osculate towards the *Aquifoliaceæ*.

With the *Sapotaceæ* it agrees in many

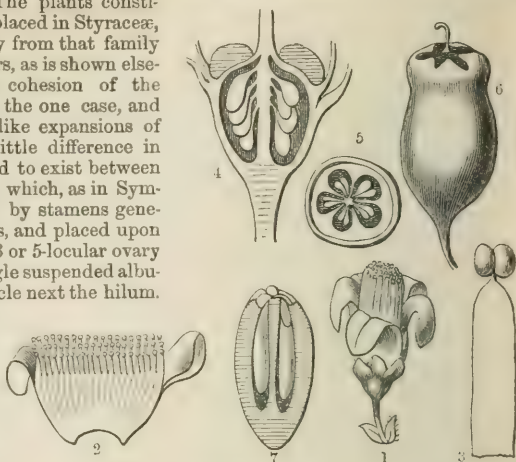


Fig. CCCII. bis.

#### GENERA.

*Symplocos*, Jacq.  
*Alstonia*, Lin.  
*Ciponina*, Aubl.

*Stemmatosiphon*, Pohl.  
[*Mongezia*, Fl. Flum.]  
*Hopea*, Linn.

*Bobua*, Adans.  
*Palura*, Ham.  
*Barberina*, Vell.

*Epigenia*, Vell.  
*Sympleura*, Miers.  
*Scyrtocarpus*, Miers.

"NUMBERS. GEN. 5. Sp.

*Erythroxylaceæ*.

"POSITION.—*Sapotaceæ*.—*SYMPLOCACEÆ*.—*Ebenaceæ*.  
*Aquifoliaceæ*.

#### "STYRACÆÆ.

"Trees or Shrubs usually clothed with stellate tomentum; leaves alternate, entire,

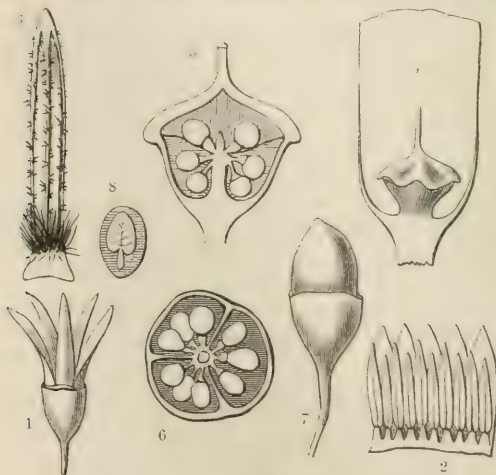


Fig. CCCII. ter.

Fig. CCCII. bis.—*Symplocos laxiflora*. 1. expanded flower; 2. corolla cut open; 3. a stamen; 4. longitudinal section of ovary; 5. transversal section of ditto; 6. ripe fruit; 7. longitudinal section of ditto—from a sketch by Mr. Miers.

Fig. CCCII. ter.—*Styrax leiophylla*. 1. a flower natural size; 2. ditto cut open; 3. stamen seen in front; 4. ovary, with half the calyx removed; 5. longitudinal section of ovary; 6. transverse ditto; 7. ripe fruit; 8. longitudinal section of seed—from a sketch by Mr. Miers.

exstipulate: inflorescence axillary or terminal, solitary, or in few-flowered racemes or panicles: flower bracteate: calyx tubular, quite free, with an almost entire border increasing and half enclosing the fruit: petals 5, with valvate aestivation, sometimes united at base by the cohesion of the stamiferous ring: stamens either equal in number to the petals, and then alternate with them, or twice or treble the number, and then always in a single series; anthers linear-oblong, nearly the length of the broad filaments to which they are adnate, and which are conjoined together at base into a short



tube generally free from the petals: ovary sessile, rarely long-stem, oblong, with a remarkable depressed apiculate gland upon apex; a terminal long, slender, acute summit, with several ridges in those very leaves an expanded perianthium. The upper row erect, the sublike horizontal; the lower pendulous from a free central placenta in the axis of the monopetalous filaments. *Styranthe* (Styranthe) somewhat capitate. Fruit drupaceous, somewhat fleshy, containing an oblong, greenish, with a single, sometimes 2 or 3, erect, beaked seed; endosperm albuminous, in fleshy albumen, with a terete radicle pointing to the hilum, seated in mucilag. foliaceous cotyledons.

The *Styracis* differ from the *Symphoricarpos*, with which they have been previously associated, in the following marked respects: by their tubular and widely exserted calyx, which increases with the growth of the fruit; by the calyx being subentire, their petals; by their stamens being always unequal; by their lower anthers being affixed to broad filaments nearly of their length, by their ovary being always in complete dissepiments; their free central placentation with ovules inserted in this series by means of fleshy prosepiments; by their fleshy large, sometimes a globose 1-celled putamen, having a single erect seed with exposed fleshy albumen. Of the terete radicle and broad acute cotyledons, and in the minute seeds that point out of the species. Their nearest affinity notwithstanding with the *Clusiaceae* (but without a corolla in the *Styracis* has been described by all authors as *guttiferum*), and therefore placed among the *Marsipetalaceae*, it is not known that in this family has been mentioned, which has been noticed in the *Plumaceae*: in both cases the petals are valvate in aestivation, and aggregated at the base by two membranaceous confluent stamens; for, on removing this annulus, they are easily separated so as to leave perfect that they are not confluent into a monophyllous tube. To many persons at present, this tendency to the agglomeration of their parts is ascribed to a more greater extent than in *Styracis*. The opposite of the two families is further strengthened by the structure of the ovary, and the suspension of the ovules from a free central placenta. The latter circumstances also show that they are allied to the *Humboldtaceae*: but in the latter family the stamens are free, a long pedicel both from the ovary, and the petals, which are hence quite free to the base.

#### GENERA.

*Styracis*, Fourn.  
*Styracis*, R. & P.  
*Styracis*, C. DC.  
*Styracis*, DC.  
*Styracis*, DC.  
*Styracis*, DC.  
*Styracis*, DC.

*Symphoricarpos*, DC.  
*Symphoricarpos*, DC.  
*Symphoricarpos*, DC.  
*Symphoricarpos*, DC.  
*Symphoricarpos*, DC.

*Styracis* - *Styracis* - *Styracis*

*Styracis*

*Styracis* - *Styracis* - *Styracis* - *Styracis* - *Styracis*



# ALLIANCE XLV. GENTIANALES.—THE GENTIANAL ALLIANCE.

DIAGNOSIS.—*Perigynous Exogens, with dichlamydeous monopetalous flowers, axile or parietal placenta, and a minute embryo, or with the cotyledons much smaller than the radicle, lying in a large quantity of albumen.*

Here we find ourselves among the truly monopetalous Orders of the French school. Previously a monopetalous structure was an exception rather than a rule; but now a separation of petals forms the exception. Tendencies have assumed a new direction.

The Alliance differs from that of Solanals in having a minute embryo and much albumen, and from Cortusals in the placenta never being free and central. It touches Solanals at Nightshades themselves, which, if they had parietal placenta might often be mistaken for Gentianworts; and at Dogbanes, whose minute embryo offers one of the principal reasons for not associating them in the same Alliance as Asclepiads. With Cortusals Gentianals come in contact through Ebenads, which are very like Ardisiads, and Diapensiads, which may be compared to Primworts. To Bignonials they are very closely allied through Broomrapes and Stilbids, which put on the peculiar aspect of that Alliance.

## NATURAL ORDERS OF GENTIANALS.

- |   |                    |
|---|--------------------|
| <i>Stipules 0. Stigmas simple, sessile, radiating . . . . .</i>   | 229. EBENACEÆ.     |
| <i>Stipules 0. Stigmas simple, at the end of a manifest style. Placenta axile. Seeds definite, pendulous. Corolla imbricated . . . . .</i>                                      | 230. AQUIFOLIACEÆ. |
| <i>Stipules 0. Stigmas collected into a massive head, expanded at the base in the form of a ring or membrane, and contracted in the middle. (Albumen sometimes 0) . . . . .</i> | 231. APOCYNACEÆ.   |
| <i>Leaves opposite, with intervening stipules . . . . .</i>   | 232. LOGANIACEÆ.   |
| <i>Stipules 0. Stigmas simple, at the end of a manifest style. Placenta axile. Seeds indefinite, peltate. Stamens interpetalous . . . . .</i>                                   | 233. DIAPENSIACEÆ. |
| <i>Stipules 0. Stigmas simple, at the end of a manifest style. Placenta axile. Seeds definite, erect. Corolla valvate. Flowers unsymmetrical . . . . .</i>                      | 234. STILBACEÆ.    |
| <i>Stipules 0. Stigmas simple, at the end of a manifest style. Placenta parietal. Flowers didynamous . . . . .</i>  | 235. OROBANCHACEÆ. |
| <i>Stipules 0. Stigmas simple, at the end of a manifest style. Placenta parietal. Flowers regular . . . . .</i>   | 236. GENTIANACEÆ.  |



## ORDER CCXXIX. EUPHORBIACEÆ. Euphorbia.

Gummiacæ, Juss. *Gyn. Dio.* (1789) *gen. et spec. pl. Ind. occ. Europ. Afric. Ind. etc.* (1800) 1. *Gen. Pl.* (1824) 1. *Fruct. Gen. Dio.* 1. *Mon. bot. p. Ind. Afric. etc.* (1825) 1. *Gen. Pl.* (1825) 1.

DIAGNOSIS.—*Arborescent Euphorbia, with bi-stipitate, and a simple smooth radiating pith.*

Trees or shrubs, without milk, and with heavy wood. Flowers single or many, without pedicels, absolutely articulated with the stem, entire, sessile. Pedicels axillary. Pedicels by abortion  $\frac{1}{2}$ , seldom  $\frac{3}{4}$ , the  $\frac{1}{2}$  with the rudiment of an ovary, the  $\frac{3}{4}$  usually with a few sterile stamens. Calyx in 3 to 7 divisions, nearly equal persistent. Corolla monopetalous, hypogynous, regular, deciduous, somewhat coriaceous, usually pubescent externally, and smooth internally; its limb with 3 to 7 divisions, imbricated in aestivation. Stamens definite, either arising from the corolla, or hypogynous; twice as many as the segments of the corolla, sometimes 4 times as many, or the same number, and then alternate with them, often inserted in pairs at the foot of the lobes of the corolla, and then neither opposite nor alternate with them; filaments simple in the hermaphrodite species, generally divided in the dioecious ones, both their divisions bearing anthers, but the inner are generally smaller; anthers attached by their base, linear-lanceolate, 2-lobed, bearing longish sometimes bearded; pollen round, smooth. Ovary smooth, without appendages, 2-celled, the cells each having 1 or 2 ovules pendulous from their apices, rarely sessile, seldom simple; stigmas bifid, or simple. Fruit fleshy, round, or oval, sometimes a few-seeded, its pericarp sometimes opening in a regular fissure. Seed with a scarious testa of the same figure as the albumen, which is copious and often 2-lobed, in the axis, or but little out of it, straight, white, generally some time left in the albumen; cotyledons foliaceous, somewhat yellow, lying close together or somewhat slightly separate; radicle taper, of middling length or long, straight, pointed, without the hilum.

Brown thinks these plants allied to Olive-worts, with which they agree in the articulation of the seeds and other points of structure; being distinguished by their alternate leaves, constantly axillary and usually unisexual flowers, the segments of which are at least double the number of the lobes of the corolla; but that comparison by the same indicates their nearest affinity, which is certainly with *Dolly* growing in the same tract, and Dogbanes on the other. The nature of these distinctions from the former is pointed out p. 579; the latter are known by their peculiar argus, branching umbelliferous form, and numerous seeds. Sapoteds, to which they are the most allied, bear a grosser plant embryo. In a large number of cases there is an affinity between sapoteds and euphorbias, have been suspected to indicate some relation to the *Dolly* and *Dogbanes*; but no exact resemblance can be traced, and in fact the separation of the *Dolly* and *Dogbanes* is but partial; rudimentary stamens being uniformly present in the *Dolly*.

Chiefly Indian and tropical; a very few are found elsewhere in the *Indo-European* in



FIG. CCXXIV.—Male plant.—*Euphorbia*. 1. a flower; 2. a fruit; 3. a longitudinal section of the fruit; 4. a fruit; 5. its section; 6. a perspective view of the fruit.



Europe, and the state of New York in North America. A few occur at the Cape of Good Hope and in New Holland.

They are remarkable for little except the hardness of the wood of such species as *Diospyrus Ebenus*, *Ebenaster*, *melanoxylon*, *Mabolo*, *tomentosa* and *Roylei*, and for the eatable quality of the fruit. The timber, of a black colour, sometimes variegated with white or brown lines, is well known under the names of Ebony and Ironwood. The fruit is noted for extreme acerbity before arriving at maturity. That of *Diospyrus Kaki* is occasionally introduced from China as a dry sweetmeat; another species is believed to furnish a fruit called the Kau Apple by the settlers in the South of Africa. Some practitioners in the United States prescribe an infusion of the unripe fruit of *Diospyrus virginiana*, also called the Date Plum, whose bark had already been employed as a febrifuge with success in cases of cholera infantum, and the worst forms of Mississippi diarrhoea. The particulars as to the manner of applying it are to be found in Hay's *American Journal of Medical Science*, October, 1842.—See *Gard. Chron.* p. 844. 1843. This tree produces a kind of gum, and the fruit when changed by frost is eaten. The fruit of *Diospyrus glutinosa*, or *Embryopteris*, is so glutinous as to be used in Bengal for paying boats.

#### GENERA.

<i>Royena</i> , L.	<i>Gunisanthus</i> , A. DC.	<i>Guaicacara</i> , Tourn.	<i>Cavanilla</i> , Lam.
<i>Euclea</i> , L.	<i>Rospidios</i> , A. DC.	<i>Ebenaster</i> , Rumph.	<i>Maba</i> , Forst.
<i>Diplazema</i> , Don.	<i>Macreightia</i> , A. DC.	<i>Paralea</i> , Aubl.	<i>Ferreola</i> , Roxb.
<i>Rymia</i> , Endl.	<i>Diospyros</i> , L.	<i>Embryopteris</i> , Gaertn.	<i>Cargilia</i> , R. Br.

NUMBERS. GEN. 9. Sp. 160.

POSITION. ————— *Oleaceæ.*  
 EBENACEÆ.—*Aquifoliaceæ.*  
*Sapotaceæ.*

#### ADDITIONAL GENERA.

*Noltia*, Schum. = *Diospyros*.  
*Kellaua*, A. DC. = *Euclea*.  
*Holochilus*, Dunal.



## Order CXXX. AQUIFOLEACEÆ. HOLLYWORTS.

*Linnaea*, *At. Brongniart Monney* (see by *Brongniart*, p. 16 (1844), *Veget. Polynésie*);  
*Agnes Chase*, *Fl. Thompson*, vol. 4, col. 1041; *2. Californica*, *de Bore*, p. 31.  
*Gray*, *Man. bot.*, p. 222.

**DIAGNOSIS.**—*Shrubby or woody, with opposite, simple segments at the end of a common style, axile placentæ, ovules pendulous, and one rudimentary ovule.*

Evergreen trees or shrubs, whose branches are often angular. Leaves alternate, opposite, simple, leathery, without stipules. Flowers small, solitary or generally in axillary racemes, solitary or clustered, sometimes  $\gamma$  by abortion. Sepals 4 to 6, imbricated in aestivation. Corolla 4- to 6-parted, hypogynous, imbricated in aestivation. Stamens inserted into the corolla, alternate with its segments; filaments erect; anthers adnate, basally, opening longitudinally. Disk none. Ovary fleshy, superior, somewhat truncate, with from 2 to 6 or more cells; ovules solitary, anatropal, pendulous, and often hanging from a cup-shaped maternal stigma subsessile, lobed. Fruit fleshy, indehiscent, with from 2 to 6 or more stones. Seed suspended, nearly sessile; albumen large, fleshy; embryo small, lobed, lying next the hilum, with minute cotyledons, and a superior radicle.

These bushes and trees were formerly included in Rhamnads by most Botanists, but have been well distinguished by Ad. Brongniart, who remarks that the suggestion of Jussieu, in his *Gen. Pl.*, that Hollyworts ought probably to be placed near Sapotads or Ebenads, will probably be adopted. From Spindletrees, with which the Order is combined in some modern works, it differs in the form of the calyx and corolla, in the disposition and insertion of the stamens, and especially in the structure of the ovary and fruit. In these respects Hollyworts are found by Brongniart to agree so completely with Ebenads, that that Order does not, in fact, differ essentially from Hollyworts, except in characters of a secondary order, such as the calyx and corolla being less deeply divided, the stamens often double the number of the segments of the corolla, the style sometimes divided, the cells of the ovary usually containing 2 collateral ovules, and, finally, in the cells of the fruit not becoming thick, as in most Hollyworts. Von Martius places them near Miliaceæ. Their most characteristic resides in their monopetalous corolla, axile placentæ, pendulous, solitary ovules, and minute embryo, lying in the base of fleshy albumen. They differ from Leguminosæ in the want of stipules, from Dogbanes in their simple racemes, and from Ebenads in their long style, the stigmas of which never have a twining appearance, in their wanting the peculiar silky corolla with a twisted imbricated aestivation, in their constant being constantly definite in number, and in the still more minute seeds of the latter.

Found sparingly in various parts of the world, especially in the West Indian Archipelago, America, and the Cape of Good Hope. Several are found in North America; but the common Holly, in Europe.

The bark and berries of *Prinos verticillatus* possess the medicinal properties of vegetable, astringent, and tonic medicines, being well understood and highly spoken of by American practitioners; the berries are said to be used by Bigelow asserts that they are emetic. A diuretic influence of the fruit of *Myrica* *Uragoga* is a most powerful diuretic. It is asserted that the leaves of *Andromeda* *Holly* (*Ilex aquifolium*), are equal to *Possong* (leaf of the same of *Urtica*).



FIG. 1005.

FIG. 1005.—*Ilex aquifolium*. 1. Branch; 2. The corolla and style; 3. A longitudinal section of the fruit; 4. A section of a seed.



fever ; the root and bark are said to be emollient, resolving, expectorant, and diuretic ; Haller recommends the juice of the leaves in icterus ; Reil also affirms that he has employed the bark successfully in cases of epidemic intermittent fever when Peruvian Bark had failed. The berries are purgative and emetic ; six or eight will occasion violent vomiting. Birdlime is obtained from the bark, and the beautiful white wood is much esteemed by cabinet-makers for inlaying ; a strong decoction of *Ilex vomitoria*, called Black drink, is used by the tribes of the Creek Indians at the opening of their councils. It acts as a mild emetic. Some species are employed as substitutes for tea, among which is the *Prinos glabra*, an ever-green North American bush. But the most celebrated is the *Ilex paraguayensis*, or Maté, whose leaves are very generally employed in Brazil and the adjoining South American governments ; of this plant, called Paraguay Tea, a full account has been given in the *London Journal of Botany*, l. p. 30 ; Mr. Stenhouse has detected Theine in its leaves. Martius states that *Ilex Gongonha*, called also *Gongonha*, and *I. theezans* are also employed in Brazil in the same manner ; he describes all three as being valuable diuretics and diaphoretics. According to the same author the leaves of *Ilex paraguayensis* and several others are used by dyers ; the fruits of *Ilex Macoucoua*, when unripe, abound in tannin, and bruised in a ferruginous mud are employed in dyeing cotton fabrics ; they act something like galls.—*Mat. Med. Br.* 126.

# GENERA.

<i>Cassine</i> , Linn.	<i>Macoucoua</i> , Aubl.	<i>Ageria</i> , Adans.	<i>Byronia</i> , Endl.
<i>Maurocentia</i> , Mill.	<i>Labatia</i> , Scop.	<i>Winteria</i> , Mönch.	<i>Polystigma</i> , Meisn.
<i>Ilex</i> , Linn.	<i>Burglaria</i> , Wendl.	<i>Nemopanthes</i> , Raf.	<i>Siphonodon</i> , Griff.
<i>Aquifolium</i> , Tournef.	<i>Chomelia</i> , Fl. Flum.	<i>Nuttallia</i> , DC.	<i>Villaresia</i> , Ruiz et Pav.
<i>Paltoria</i> , Ruiz et Pav.	<i>Prinos</i> , Linn.	<i>Ilicioides</i> , Dumort.	<i>Citronella</i> , Don.

NUMBERS. GEN. 11. Sp. 110.

*Rhamnaceæ.*

POSITION.———*AQUIFOLIACEÆ.*——*Ebenaceæ.*

*Sapotaceæ.*







The kernels of *Cerbera manghas* are also emetic and poisonous ; the milky sap is purgative ; the leaves and bark are used in Java as a substitute for Senna. In *Thevetia arohaui* the seeds are also poisonous ; the bark and sap emetic and narcotic ; and *Thevetia nerifolia* has a dangerous venomous milk ; yet its bitter and cathartic bark is reported to be a powerful febrifuge, 2 grains only being affirmed to be equal to an ordinary dose of Cinchona. The wood of both these has a heavy repulsive odour, and is used, in the countries where they are wild, for poisoning fish. *Hasseltia arborea* must be classed among the poisons. In Java the milk obtained from the trunk by incision, mixed with honey, and reduced with boiling water, is employed as a powerful drastic for destroying the tape-worm ; it is however apt to produce inflammation of the intestines, and is even in some cases fatal. The milk of the *Plumieras*, although said to be cathartic or drastic, is excessively corrosive ; they are however employed by practitioners in tropical countries. *Cameraria latifolia* is named the Bastard Manchineel-tree, from its resemblance in quality to that formidable tree. From a species of *Echites* the Mandingoes are said to obtain a poison with which their smear their arrows. In general the genus is narcotic, or rather stupefying, but with considerable acrimony, whence the species are employed, especially their roots, as drastics and epispastics.—*Stadelmeyer, Echit.* p. 3. The common Oleander, *Nerium Oleander*, although little suspected, is a formidable poison. A decoction of its leaves forms a wash, employed in the south of Europe to destroy cutaneous vermin ; and its powdered wood and bark constitute at Nice the basis of an efficacious rat poison. A few years ago, a child died from having eaten one morning a quantity of Oleander flowers ; it was seized with violent colic, under which the child sunk at the end of two days. In 1809, when the French troops were lying before Madrid, some of the soldiers went a marauding, every one bringing back such provisions as could be found. One soldier formed the unfortunate idea of cutting the branches of the Oleander for spits and skewers for the meat when roasting. This tree, it may be observed, is very common in Spain, where it attains considerable dimensions. The wood having been stripped of its bark, and brought in contact with the meat, was productive of most direful consequences, for of twelve soldiers who ate of the roast seven died, and the other five were dangerously ill.—*Gard. Chronicle*, 1844, p. 23. In like manner the root of *Nerium odorum* is found to be a poison in India. When, however, these dangerous qualities are moderated, the species become useful medicinal agents, either as emetics or cathartics. The *Apocynums androsæmifolium* and *cannabinum* are emetic, diaphoretic, and diuretic, and in small doses tonic. An infusion of the leaves of *Allamanda cathartica* is considered a valuable cathartic medicine, in moderate doses, especially in the cure of painters' colic. In over doses it is violently emetic and purgative. The root of *Rauwolfia nitida* is used for similar purposes. Not a few species of the Order lose their acrimony either wholly or in a great degree, and then we find them applied as febrifuges or even aromatics. The root of *Ophioxylon serpentinum* is employed by the Telinga physicians of India as a febrifuge and alexipharmic, and also to promote delivery in tedious cases. The bark of *Alyxia stellata* is aromatic, with similar effects to those of *Canella alba* and *Drymis Winteri*, for which it may be substituted. It has been introduced into German practice as a remedy for chronic diarrhoea and nervous complaints ; it has the odour of Melilot, and traces of Benzoic acid have been found in it. The Conessi bark, a valuable astringent and febrifuge, called *Palapatta* in Malabar, is obtained from *Wrightia antidysenterica*. *Ichnocarpus frutescens* is sometimes used in India as a substitute for *Sarsaparilla*. The wood of *Alstonia scholaris*, and some Madagascar *Carissas*, is as bitter as Gentian. *Hancornia pubescens*, and several other Brazilian trees, are mentioned by Martius as possessing similar qualities. It is not a little remarkable, then, that in such an Order as this some species should occur which are absolutely inert ; yet such appears to be the case in several instances. *Tabernaemontana utilis*, the *Hya Hya*, is one of those Cow-trees of equatorial America, which derive their name from pouring forth a copious stream of thick, sweet, innocuous milk. Even the *Cerberos Odollam*, *lactaria*, and *salutaris*, seem to possess none of the venom for which the species above mentioned are celebrated. *Caoutchouc*, or a substance analogous to it, is supplied by several plants of the Order. *Collophora utilis*, and *Cameraria latifolia* yield it in South America ; *Vahea gummifera* in Madagascar ; *Urceola elastica* and *Willughbeia edulis* in the East Indies, the former of fine, and the second of indifferent quality. Although some species bear fruit that is eatable, yet they do not appear to possess much merit. That of *Hancornia* is said by Martius to be sweet, sub-acid, and vinous. *Willughbeia edulis* derives its name from the use that is made of its fruit in India. *Carissa Carandas* furnishes a substitute for Red Currant Jelly ; to these may be added the *Pishamins* (*Carpodinus*) of Sierra Leone, *Melolinus monogynus*, *Carissa edulis*, and a few more. Some are used for dyeing, the chief of which is *Wrightia tinctoria*, which yields Indigo of good quality. Little is known of their timber ; that of *Wrightia coccinea* is light



and tough, and used for making *Talapatana* [of *Wrightia* *talapatana* *Wrightia* for turners. *Aspidosperma* *exaltata* is substituted in *Schomburgk*. Sometimes the trunk growing at the lower part into tubular peripetals, forming sometimes a thick skin the Indians as ready-made planks, and in the construction of their paddles. The leaves appears as if fluted, or rather as if it consisted of numerous slender leaves joined together along their whole length.

The sages of Ceylon having demonstrated, as they say, that *Pernambuco* was in this island, and having therefore found it necessary to seek out the true native tree of the garden of Eden, assure us that it was to be found in a species of this genus. The truth of this discovery consists in the beauty of the fruit, and its being found in the mountains of the flower, and in its still bearing the marks of the teeth of Eve. If the authors were committed, which brought misery on man, we are assured that the fruit was delicious, but from that time forward it became poisonous, as it now remains. *Bot. Rep.* 140. *sub. t.* 53.

## GENERA.

I. WITH CORNERS.—Fla-  
cently parietal.

Allamanda, L.  
*Ocotea*, Aubl.  
Chilocarpus, Bl.  
? *Lanifolia*, Pal.  
Willughbeia, R. & B.  
*Anthephylus*, Wall.  
Conna, Aubl.  
? *Colophaea*, Mart.  
? *Pacouria*, Aubl.

II. CARINATE.—Ovary  
single, 2 celled. Seeds  
naked.

Cuspidospermum, Boj.  
? *Plectanica*, *Phacelia*.  
Maycockia, A. DC.  
Hancornia, Guss.  
*Mancinella*, Vis.  
Winchia, A. DC.  
Viburnum, Lam.  
Amelanchia, A. DC.  
Carpodinus, R. Br.  
Melodinus, Presl.  
Bicorona, A. DC.  
Lanceolatus, Jack.  
Carissa, L.  
*Andromeda*, L.  
*Alchornea*, Forsk.  
? *Toxicopeltis*, Harp.  
Rauwolfia, Wurm.  
Opheoxylon, L.  
*Tournefortia*, Rheede.

Thevetia, L.

Alseodora, Pl.

III. PREMISERY.—Ovary  
double. Seeds naked.

Alyxia, R. Br.  
*Goussieria*, Presl.  
Valeriana, R. P.  
Humboldtia, R. & B.  
Kopsia, Willd.  
*Calycotome*, Don.  
Cerbera, L.

*Morinda*, Burm.  
*Tanacetum*, Presl.  
*Ocotea*, Juss.  
*Viburnum*, Presl.  
*Ipomoea*, Boj.  
orchipeda, Bl.

*Urena*, L.  
*Ronchocarpus*, A. DC.  
*Stemmadenia*, Presl.  
*Ocotea*, Presl.  
*Peschiera*, A. DC.

*Tabernaemontana*, Presl.  
*Peschiera*, Presl.  
*Ronchocarpus*, Gaud.  
*Ronchocarpus*, Presl.

Conopharyngia, Presl.  
Malouina, A. DC.  
Condalia, Presl.

Vinea, L.  
*Persea*, L.  
*Chloranthus*, Don.  
*Leucaena*, R. & B.  
Annona, Willd.  
Rhaiza, Dec.

*Physalis*, L.  
*Physalis*, L.  
*Physalis*, L.  
*Physalis*, L.  
*Physalis*, L.

IV. PREMISERY.—Ovary  
single. Seeds naked.

*Viburnum*, Presl.  
*Viburnum*, Presl.  
*Viburnum*, Presl.  
*Viburnum*, Presl.  
*Viburnum*, Presl.

V. WINGED.—Ovary  
double. Seeds naked.

*Willughbeia*, R. & B.  
*Rhaiza*, Dec.  
*Rhaiza*, Dec.  
*Rhaiza*, Dec.  
*Rhaiza*, Dec.

*Willughbeia*, R. & B.  
*Rhaiza*, Dec.  
*Rhaiza*, Dec.  
*Rhaiza*, Dec.  
*Rhaiza*, Dec.

*Willughbeia*, R. & B.  
*Willughbeia*, R. & B.  
*Willughbeia*, R. & B.  
*Willughbeia*, R. & B.  
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*Willughbeia*, R. & B.  
*Willughbeia*, R. & B.  
*Willughbeia*, R. & B.

NUMBERS. GEN. 100. Sp. 100.

*Andromeda*.

POSITION.—Gentianaceae.—APOCYNACEAE.—L.

## ADDITIONAL GENERA.

Oxynus, L. = Melodinus.

Epilobium, Presl.

Hostmannia, M. &amp; P.

Rousselia, B. &amp; P. near Tabernaemontana

*Conocarpus*, Presl.*Conocarpus*, Presl.*Conocarpus*, Presl.*Conocarpus*, Presl.

A large quantity of *Cautechone* is obtained in *Malabar* from the *Viburnum* *cautechone* *malabarica*.—*Boj.* Dr. Gardner says that the fruit of *Cautechone* is delicious. It is called *Mancinella* by the Indians, and that tree is brought in great quantities to *Pernambuco* for sale. *Journ. Bot. Soc. Lond.* 1. Dr. Gardner the fruits of *Carissa* *edulis* and *tormentosa* are eaten. A. DC.



## ORDER CCXXXII. LOGANIACEÆ.—LOGANIADS.

Loganiæ, *R. Brown in Flinders*, (1814); *Von Martius N. Gen. et Sp. Pl.* 2. 133; *Bartl. Ord. Nat.* 205; *Arnott in Edinb. Encycl.* 120.—Loganiaceæ, *Ed. Pr.* cxxiv.; *Endl. Gen.* cxxi.; *DC. Prodr.* 9. 1.—Potaliaceæ, *Brown in Tuckey*, 449. (1819).—Potaliæ, *Martius N. G. et Sp.* 2. 91. and 133. (1828); *Royle Illustr.* 269.—Strychnaceæ, *Blume Bijdr.* 1018. (1826); *Liak. Handb.* 1. 439.—Strychnæ, *DC. Théorie* ed. 1. 217. (1813). Spigeliaceæ, *Martius N. G. et Sp.* 2. 132. (1828); *Ed. pr.* cxxi.; *Endl. Gen.* cxxxv.; *Meisner p.* 258.—Cælostylæ, *Endl. Ench.* cxxiii.

DIAGNOSIS.—*Gentianal Exogens, with opposite leaves and interrening stipules.*

Shrubs, herbaceous plants, or trees. Leaves opposite, entire, usually with stipules, which adhere to the leafstalks or are combined in the form of interpetiolar sheaths.



Fig. CCCCVII.

Flowers racemose, corymbose, or solitary. Calyx valvate or imbricated, inferior, 4- 5-parted. Corolla regular or irregular, 4- 5- or 10-cleft, with valvate or convolute æstivation. Stamens arising from the corolla, all placed upon the same line, and not always symmetrical with the divisions of the corolla; pollen with 3 bands. Ovary superior, 2-celled, (3, or spuriously 4-celled); style continuous; stigma simple; ovules 00 or solitary, peltate and amphitropal, or ascending and anatropal. Fruit either capsular and 2-celled with placentæ finally becoming loose; or drupaceous, with 1- or 2-seeded stones; or berried with the seeds immersed in pulp. Seeds sometimes winged, usually peltate; albumen fleshy or cartilaginous; embryo small, with the radicle turned towards the hilum or parallel with it.

It is not clear, from the remarks upon Logania, by Brown in his *Prodromus*, whether he intended to establish this Order or not. He states that he has placed Logania at the end of Gentianworts, on account of some affinity between it and Exacum and Mitrasacme, and also because it does not answer ill to the artificial character of that Order; adding that it, however, might have a still closer connection with Dogbanes and with Usteria among Cinchonads. He further points out the close relation of Geniostoma to Logania, and concludes by inquiring whether those 2 genera do not, with Anasser, Fagrea, and Usteria, form an Order intermediate between Dogbanes and Cinchonads.

This view has been adopted by Von Martius, who however excludes Fagrea, which he places among his Potaliaceæ; he founds the distinction of that Order upon the want of symmetry between the parts of the calyx, corolla, and stamens, upon the æstivation of the corolla being convolute, not contorted, and in the presence of stipules combined in interpetiolar sheaths. Mr. Arnott remarked to me (letter, Dec. 1835) that the Order may be in some respects looked upon as consisting of Cinchonads with superior fruit. More recent examination of the genera has entirely confirmed this view, which, however, does not explain with any clearness how Loganiads differ from Dogbanes. Upon this subject I quote literally the words of M. Alph. De Candolle. "I must confess that I have sought in vain for a positive distinction, to which there shall be no exception, between Dogbanes and Loganiads. The position of the flower with respect to the axis appears to be the same, that is to say, a re-entering angle of the calyx stands next the axis. That of the cells of the fruit with respect to the axis varies among Loganiads, as does the æstivation of the corolla and many other characters. The grains of pollen are not very different, if we rely upon the exact but scanty observations of Mr. Hassall. The placentas of Dogbanes are more securely fastened to the edges of the carpellary leaves, and do not separate from them when the fruit is ripe, as generally happens more or less distinctly among Loganiads; but the placenta of Strychnos is exactly that of Carissa. Dogbanes have a milky juice; but exceptions to that are said to occur, as in Echites for instance. Finally, the only differences which I can point out are of a particular kind, not very satisfactory in practice, although of some value in botanical philosophy. These reside in the nature of the variations presented by Dogbanes and Loganiads. In the former the flowers are always isomerous in the calyx, corolla, and stamens, and the number is never more than 5; in the latter the corolla and stamens have

Fig. CCCCVII.—Logania floribunda. 1. a corolla cut open; 2. a pistil.



sometimes more pieces than the calyx, as in *Passiflora*; but sometimes are sometimes reduced to one, as in *Urtica*. The stamens of *Dogbanes* a slender structure with the limb of the corolla; those of *Loganiads* vary more or less from this position, and become opposite in *Petalia*. In *Dogbanes* the number 2 in the support of the calyx, and in *Loganiads*, one genus, *Lobelia*, has 5 cells. In *Dogbanes*, the insertion of the corolla is always twisted, except in *Moraccharia*, where it is straight, and is a torsion of the back of each lobe, which indicates the tendency of the corolla, as in *Loganiads* the aestivation is very variable, and is often oblique or the straight position, of the term. *Dogbanes* often have hypogynous glands, or a compound one; *Loganiads* have not a trace of either. The first have often independent ones of the corolla; the second never have any, unless we so consider the large single gland of the corolla. The stigma is often of considerable size, and bears a position and of gland in *Dogbanes*; *Loganiads* have no such appendages. This last is the true *Loganiads* character.

All *Loganiads* are either tropical or sub-tropical countries near the equator; a few temperate species in New Holland and America forming the only exception.

It would be difficult to name a more venomous Order than this, of which *Quinine* the celebrated *Nux Vomica* may be taken as the representative. This fatal drug comes of

the seeds of *Strychnos Nux Vomica*, an Indian tree, with small greenish-white flowers, ribbed leaves, and a beautiful orange-coloured round fruit, the size of a small Apple, having a brittle shell, and a white gelatinous pulp. The wood is exceedingly bitter, particularly that of the root, which is used to cure intermittent fevers, and the bites of venomous snakes. The seeds are employed in the distillation of country spirits, to render them more intoxicating. The pulp of the fruit seems perfectly innocent, as it is greedily eaten by many sorts of birds. *Root*. The seeds are extremely poisonous, in large doses producing extraordinary rigidity and convulsive contraction of the muscles previous to death. In very small and repeated doses it promotes the appetite, assists the digestive process, increases the secretion of urine, and sometimes acts slightly upon the bowels. It is employed medicinally in paralysis, dyspepsia, dysentery, affections of the nervous system, &c., and appears to be very active in venereal diseases.

Another virulent kind is the *Strychnos toxifera*, which forms the base of a violent poison called *Woorari* or *Quari*. Dr. Hanes & Smith it is the same genus, and is of nature. For an account of it by Sir R. Schomburgk, see *Jour. As. Soc. B. 1841*. From the bark of the root of *Strychnos Tientia* another fragrant poison is prepared in Java, where it is called *Tjetek* and *Upas Kioja*; it acts like *Nux Vomica*, but in a more intense and violent manner. Notwithstanding the active qualities of these poisonous plants, others are used in medicine with advantage. *Strychnos Lancia* is used by Blume to yield the genuine *Lignum colubinum*, a drug some hold in great estimation, a remedy for paralysis of the lower extremities; it is also used by the natives of Sumatra, and to be useful in blenorrhœa faucium et laryngis. Blume also remarks that it is subject in Java. Blume adds that several other species of the genus are found in the market under the name of *Lignum colubinum*. *Strychnos pinnatifida* is said to be the best febrifuge in Brazil; with the exception of the fruit, which is said to be without danger, all the parts, especially the bark, are extremely bitter and rather poisonous. It is universally employed instead of Cinchona, and is reported to be the best in the Russian Bark, in the cure of the intermittents of Brazil. *Vaccinium* has been found in the bark and could find in it neither brucine, nor strychnine, but quinine. It is called *Woorari* the name of *Copalehe* bark. The seeds of *Ignatia amara*, called St. Ignace's Beans, are used successfully in India as a remedy for children, under the name of *Papaver* bark.



Fig. CCCCXIII.

Fig. CCCCXIII. *Strychnos ligustrina*. 1. A branch; 2. A section of the fruit; 3. A seed across; 4. Seed; 5. the same more magnified and dissected.



diness and convulsions are known to follow their exhibition, if given in an over-dose. In India there is a nut called the Clearing Nut, of which the ripe seeds are dried, and sold in every market, to clear muddy water. The natives never drink clear well water, if they can get pond or river water, which is always more or less impure according to circumstances. One of the seeds is well rubbed for a minute or two round the inside of the vessel, generally an unglazed earthen one, containing the water, which is then left to settle; in a very short time the impurities fall to the bottom, leaving the water clear. The natives of India eat the pulp of the fruit when ripe; Dr. Roxburgh found it disagreeable. These nuts are produced by *Strychnos potatorum*. Bitter Almonds are said to be employed for the same purpose in Egypt, and those of the Kola, or *Sterculia*, in Sierra Leone. The *Spigelia* participate in the noxious properties of *Strychnos*. Both root and leaves of *Spigelia marilandica*, the Carolina Pink-root, and *S. anthelmia*, are active anthelmintics; their efficacy is much impaired by keeping. They are also purgative and narcotic in a slight degree, seem to be acrid narcotics, and are apt to produce very unpleasant symptoms after being exhibited; dimness of sight, giddiness, dilated pupil, spasms of the muscles of the eyes, and even convulsions are reported by Barton to have been brought on by them. *Spigelia glabrata* is reckoned by Martius among poisons; and Mr. Hartweg reports that a species of the same genus kills dogs in equatorial America. An infusion of the leaves of *Potalia resinifera* is slightly mucilaginous and astringent, and is used in Brazil as a lotion for inflamed eyes. *Potalia amara* is bitter like the *Gentians*, and acrid and emetic like *Dogbanes*.

#### GENERA.

##### I. SPIGELIÆ.

*Spigelia*, L.  
*Canala*, Pohl.  
*Montira*, Aubl.  
*Arapabaca*, Plum.  
*Cælostylis*, Torr. et Gr.  
*Mitreola*, L.  
*Mitrasacme*, Lab.

##### II. STRYCHNÆ.

*Strychnos*, L.  
*Rouhamon*, Aubl.  
*Lasiostoma*, Schr.

*Brehmia*, Harv.

*Ignatia*, L.

*Pagamea*, Aubl.

*Gardneria*, Wall.

*Cyathospermum*, Wall.

*Antonia*, Pohl.

*Labordia*, Gaud.

*Usteria*, W.

*Monodynamis*, Gmel.

##### III. LOGANÆ.

*Logania*, R. Br.

*Euosma*, Andr.

*Stomandra*, R. Br.

*Geniostoma*, Forst.

*Anasser*, Juss.

*Hæmospermum*, Bl.

*Fagraea*, Thunb.

*Kuhlia*, Reinw.

*Utania*, Don.

*Kentia*, Steud.

*Cyrtophallum*, Reinw.

*Picrophloeus*, Bl.

*Gærtnera*, Lam.

*Frutesca*, DC.

*Andersonia*, Schl.

*Sykesia*, Arn.

*Potalia*, Aubl.

*Nicandra*, Schreb.

*Anthocleista*, Afz.

? *Codonanthus*, G. Don.

? *Anabata*, W.

*Sulzeria*, R. et Sch.

NUMBERS, GEN. 22. Sp. 162.

*Cinchonaceæ.*

POSITION.—*Apocynaceæ.*—*LOGANIACEÆ.*—*Gentianaceæ.*

*Rhizophoraceæ.*

*CASSIPOUREÆ*, (*Meisn. Gen. p. 119.*—*Legnotideæ*, *Bartl. Ord. Nat. Endl. Gen. 1186*). Trees or shrubs.



Fig. CCCCIX

Leaves opposite, nearly entire, with interpetiolar stipules. Flowers axillary, solitary, or clustered. Calyx campanulate, 4-5-cleft, valvate. Petals 4-5, fringed, inserted into the bottom of the calyx. Stamens 2 or 3 times as many as the petals, distinct, inserted into the bottom of the calyx or the back of a disk; filaments free; anthers 2-celled, turned inwards. Ovary superior, 3- to 5-celled; ovules 2 or many in each cell, pendulous or attached to the axis; style simple; stigma obtuse. Fruit berried or capsular. Embryo in the axis of fleshy albumen; radicle superior; cotyledons flat or half-cylindrical.—These are tropical shrubs, and are usually placed with Mangroves; but their seeds have albumen, and the ovary is perfectly distinct from the calyx. The points of resemblance consist in the fleshy valvate calyx, the fringed petals, which are like those of *Kandelia*, and the presence of stipules. Brown, after comparing this *Cassipourea* with the Mangroves called *Carallias*, was led to conclude that we have a series of structures connecting *Rhizophora*, on the one hand, with certain genera of *Loosestrifes*, particularly with *Antherium*, though that genus wants the intermediate stipules; and, on the other, with *Coniunadi*, especially with the simple-leaved species of *Ceratopetalum*.—*Congo*. 437. This is doubtless the fact, and *Cassipourea* may probably be regarded as one of those osculant groups whose relationship is nearly equal in several opposite directions. But upon the whole it seems to have more real affinity with *Loganiads* than with the Orders just mentioned. Its

Fig. CCCCIX.—*Cassipourea elliptica*.—Hooker. 1. a flower; 2. stamens; 3. pistil; 4. cross section of the ovary.



valvate only, perigynous. Stamens, 4, equal, filaments, 10-15 times longer than anthers. Anthers, 2-3 times longer than broad, much the same as in the Loganiaceae. The fruit, 4-lobed, sepals, 4, persistent, lobes, 4, spreading. Station it has as a doubtful group, which has some of the characters of the Loganiaceae, and the Gentianales more completely examined.

# GENERA.

*Dryopteris*, L.

*Microsiphia*, Wieg. & G.

*Campylanthus*, Guss.

*Urtica*, L.

*Isotria*, Swartz.

*Isotria*, Thunberg.

*Isotria*, Spreng.

NUMBERS: GEN. 2 Sp. 7.

## ADDITIONAL GENERA OF LOGANIACEAE.

*Isotria*, L. and Guss.

*Isotria*, L. and Guss.

*Isotria*, L. and Guss.

*Isotria*, L. and Guss.

*Isotria*, L. and Guss.

*Isotria*, L. and Guss.

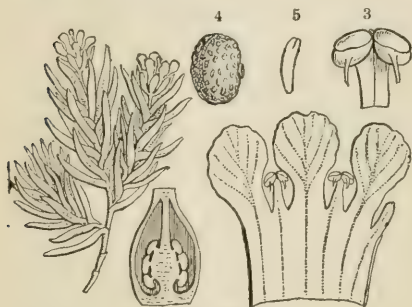


## ORDER CCXXXIII. DIAPENSIACEÆ.—DIAPENSIADS.

Diapensiaceæ, *Link Handb.* 1. 595. (1829); a § of *Convolvulaceæ*; *Ed. pr.* No. clxxvii. (1836); *Endl. Gen.* p. 760.; *Meisner Gen.* p. 272.

**DIAGNOSIS.**—*Gentianal Exogens*, with no stipules, simple stigmas at the end of a manifest style, axile placentæ, indefinite peltate seeds, and interpetalous stamens.

Prostrate under-shrubs, with small densely imbricated leaves which have scarcely any visible veins. Flowers solitary, terminal.



2 Fig. CCCCX.

Calyx composed of 5 sepals which form a broken whorl, are rather unequal, and much imbricated; scarcely distinguishable from the bracts which are closely imbricated round it. Corolla monopetalous, regular, with an imbricated æstivation. Stamens 5, equal; the filaments petaloid and arising from the margin of the sinus of the corolla; anthers 2-celled, with a broad connective, bursting transversely; in *Pyxidanthera* awned on the lower valve. Disk 0. Ovary 1 superior, 3-celled; each placenta with 7 ovules in *Pyxidanthera*, with an indefinite number in *Diapensia*; style single, continuous with the ovary; stigma sessile, with 3 very short decurrent lobes. Capsule membranous

or papery, surrounded with the permanent sepals, terminated by the rigid style or its base. Seeds with a brittle deeply pitted skin, peltate. Embryo very small, with a slender radicle and two very short cotyledons, lying across the hilum in a mass of fleshy albumen.

From the manner in which *Diapensia* was associated by Brown (*Prodromus*, 432), when he separated it along with *Hydroleaceæ* from *Bindweeds*, it has been generally supposed that this profound Botanist intended to refer *Diapensia* to the former spurious Order. But *Diapensia* is in reality nearer *Phloxworts* than *Hydroleaceæ*, and yet more nearly allied by its small embryo and copious albumen to *Hollyworts* and *Loganiads*. *Hydroleaceæ* themselves must merge in *Hydrophylls*, and the free central placentation of that Order forbids the association with it of *Diapensiads*. The chief resemblances consist in *Diapensia* having the filaments petaloid, and originating not from within the corolla but from the margin of the sinuses, so that the corolla might be described as 10-cleft, five of the divisions being broad and coloured, and the other five much narrower, and shorter, colourless, and having anthers; and in the embryo being filiform, slightly 2-lobed at one end. But both *Diapensia* and *Pyxidanthera* disagree with *Hydrophylls* in having a calyx consisting of five unequal sepals forming a broken whorl; in having the anthers bursting transversely, and with a very broad connective; in having only one style instead of two; in being destitute of an hypogynous disk; and finally, in the embryo lying in the midst of fleshy albumen across the hilum. At least this is certainly the case in *Pyxidanthera*, and I have no reason to doubt its being equally the case with *Diapensia*.

Let me add, that although the name of *Diapensiaceæ* originated with Link, yet that author in placing it among *Bindweeds* was obviously unacquainted with its real structure, and in assigning it for a character "semina membranâ inclusa," seems to have assumed that in this respect it agrees with *Hydrophylls*, which is not the fact.

The species are mountain plants of the north of Europe and North America.

They are not known to possess any useful properties.

#### GENERA.

*Diapensia*, *L.*

| *Pyxidanthera*, *Michx.*

NUMBERS. GEN. 2. Sp. 2.

*Hydrophyllaceæ.*

POSITION.—*Loganiaceæ*.—*DIAPENSIACEÆ*.—*Stilbaceæ*.

Fig. CCCCX.—*Pyxidanthera barbulate*. 1. corolla cut open; 2. perpendicular section of the ovary; 3. anther; 4. seed; 5. embryo.



## ORDER CCXXIV STILBACEAE—Stilbaceae

Stillman, *Kueth in earnest*. Kansas City, Mo.: American Book Co., 1909. Pp. 160. \$1.00. (The Greenbacker.)

Diagnosis.—*Chelonicus* *Flammula*, with no striae, length of 10, and 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 84

Cape shrubs, with the habit of a *Phoradendron* or a *Passiflora*. Leaves alternate, ovate-lanceolate, entire, leathery, rigid, articulated at the base, without glands, with 2 or 3 small, sessile, sharp-pointed spikes at the point of the branches, usually each with 3 bracts at the base, occasionally polygamous. Calyx tubular, campanulate, with a 5 cleft limb, the segments of which are equal; the two lower sometimes cut deeper; seldom 3-leaved or 2-valved; permanent. Corolla monopetalous, hypogynous; the tube enlarged upwards, with a ring of hairs in the throat; the limb valvate, 5 parted, spreading, somewhat 2-lipped, rarely 4-parted, and nearly regular. Stamens equal in number to the segments of the corolla, and alternate with them, inserted between the lobes, the upper one of five always rudimentary, or even obliterated; filaments free; anthers elliptical, oblong, attached by the back, 2-celled; opening longitudinally by their face. Ovary superior, sessile, 2-celled; cells with only one erect ovule; one cell sometimes smaller and empty; style terminal, filiform, exerted; stigma simple, emarginate. Disk 0. Fruit dry, 1-seeded, indehiscent, surrounded by the permanent calyx. [Seed erect, with a loose cellular testa. Embryo short, in the axis of very firm fleshy albumen, orthotropal; cotyledons scarcely distinct; radicle inferior.—*Endl.*]

This little Order has never yet been well examined, and no good figures of any of the species can be found in books. The seeds have been seen in only one or two cases, and the whole of the details require verification and re-examination. According to Kunth, they differ from Selagids in little except having 2-celled anthers, erect ovules, and no hypogynous disk, and he also compares them with *Adiantum*, which I regard as a more form of the Selagids themselves. Endlicher compares them to *Veronica*. All these comparisons have doubtless been influenced by the conventional theories which appear as if didynamous. But in truth they are not so, in such manner as I have been able to examine, namely *Stille pinnata* and *crispata*, or *Campylanthus* *distichus* and *cernua*, with some others in the herbaria of Sir W. Hooker and Mr. Wiegand, and what is more important, the stamens originate invariably from between the lobes of the corolla. In habit they may doubtless be compared to *Selagin*, and some *Veronica*, but they are quite as much like *Diosma*, or *Phytolacca*, as *Veronica*. If to these circumstances we add the presence of a minute embryo with scarcely any cotyledons (which according to Endlicher is the structure, *Stille* has can hardly be associated with any of the Orders hitherto suggested. To me they appear far more like *Urtica* and *Urtica*, and the Order of *Diapensiads*, of which they seem to be an intermediate form. There is a strong tendency to polygamy in the original structure of *Campylanthus* and *Stille*.

**References**

Fig. CCCXI. *Stylis Pinastri* (leaf miner). 1. The mature caterpillar; 2. a puparium feeding on the ovary.



unusual in the Echial, but not at all in the Gentianal Alliance. They possibly bear the same relation to Diapensiads as Broomrapes to Gentianworts.

All are natives of the Cape of Good Hope.

Their uses are unknown. They are somewhat resinous shrubs.

#### GENERA.

*Stilbe*, L.

*Luhia*, Schmidt.

*Campylostachys*, Kunth.

*Eurylobium*, Hochst.

#### NUMBERS. GEN. 3. Sp. 7.

*Bruniaceæ*.

POSITION ——— ~~STILBACEÆ.~~ ——— *Diapensiaceæ*.

*Selaginaceæ*.

M. Alph. De Candolle (*Prodr.* *XII.* 604) stations these between Labiates and Globulariads, and finds their anther-cells always confluent at the apex, forming but one cell. See also *Hooker's Journ. Bot.*, *II.* 348.

#### ADDITIONAL GENUS.

*Euthystachys*, A.DC.



## ORDER CCXXXV. OROBANCHACEÆ.—BROOMRAPES.

*Orobanchæ*, *Juss. Ann. Mus.* 12, 445 (1808 : *Reich. in Pers. Synops.* 2, 181 : *Jour. de Phil.* 1808, *Gall.* 348 : *Benth. Ord. Nat.* 173 : *Endl. Gen. Chy.* : *Walpers Repert.* 1, 611 : *Philips. Gener. Florum*, *Pr. Lin.* p. 73.—*Orobanchaceæ*, *Leach Hortic.* 1, 300 (1826 & 3 : *Pers.* 1845).

**DIAGNOSIS.**—*Gentianal Ecogens*, with no stipules, simple stigma at the end of a sessile style, parietal placenta, and didynamous flowers.

Herbaceous leafless plants, growing parasitically upon the roots of other species. Stems covered with brown or colourless scales. Calyx divided, persistent, imbricate. Corolla monopetalous, hypogynous, irregular, persistent, with an imbricated aestivation. Stamens 4, didynamous. Anthers occasionally 1-celled, but more generally 2-celled, the cells distinct, parallel, often mucronate, or bearded at the base. Ovary superior, 1-celled, seated in a fleshy disk, with 2 or more parietal polyspermous placenta, the 2 carpels of which it consists placed right and left of the axis ; style 1 ; stigma 2-lobed. Fruit capsular, inclosed within the withered corolla, 1-celled, 2-valved, each valve bearing 1 or 2 placenta in the middle. Seeds indefinite, very minute ; embryo minute, at the base of fleshy albumen.

Broomrapes are generally compared with Gesnerworts and Figworts, from both which they are very different in habit. They are distinguished from Gesnerworts by the important circumstance of their seeds having only a minute embryo lying in one end of fleshy albumen, and spherical pollen, while the embryo of Gesnerworts is cylindrical and erect, occupying the axis of a small quantity only of albumen, and the pollen elliptical, with a furrow on one side. In Gesnerworts the seeds are attached by rather long funiculi, while they are absolutely sessile in Broomrapes. Moreover, there is a tendency in the latter to become pentandrous, or even hexandrous ; not only does no such tendency exist in the former, but the reverse takes place, in the occasional increased sterility of the stamens. There is scarcely any trace in *Orobanche* of the glandular processes of the disk of Gesnerworts, or at least nothing more than a thin glandular coating to the base of the ovary. From Figworts, to which their didynamous stamens have caused them to be

compared, they are known by their 1-celled ovary and minute embryo ; as well as by their habit and parasitical mode of growth. In this respect they resemble Figworts, from which they differ in their ovary being composed of 2, not 3 carpels, and in their irregular unsymmetrical flowers, with epipetalous stamens. There can be little doubt, however, that the nearest affinity of Broomrapes is to Gesnerworts, with many of which, as for example, *Voyria*, they even correspond in their habit nearly being, and moreover in their corolla adhering firmly to the base of the fruit which it encloses when

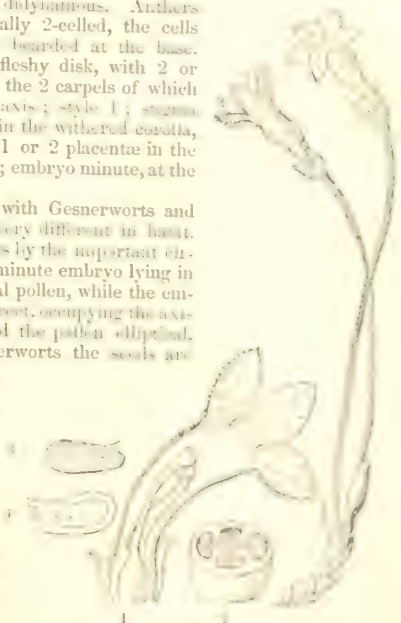


FIG. CCCXXII.

FIG. CCCXXII.—*Anaplanthus medius*. 1, a flower cut open ; 2, a section of the ovary ; 3, a magnified view of the embryo ; 4, the section of it to show the embryo.



ripe. The great points of resemblance between *Orobanche* and *Gesnerworts* and *Figworts* consist in their monopetalous didynamous flowers and bicarpellary polyspermous fruit; and it is these which have led to the general opinion that all the Orders are closely allied. Such marks of agreement are doubtless important; but they may be overbalanced by circumstances of disagreement of more importance. One of these is the position of the carpels with respect to the axis of inflorescence. In the whole category of personate, labiate, or irregular plants forming the Bignonial Alliance, the carpels stand fore and aft with respect to the axis; while in *Gentianworts* we have as universally the two carpels placed laterally. In this striking character *Orobanche* agrees with the latter. Now as a didynamous structure is not universal in Bignonials, while the position of carpels is constant through both series respectively, we must assign the greater importance to the latter character, and hence *Orobanche* would be removed from Bignonials to the series represented by *Gentians*; of which this genus would be a didynamous form, analogous to what frequently occurs among Bignonials. If to this we add the resemblance between *Broomrapes* and *Gentians* in the minuteness of their embryo as compared with the albumen, no doubt can, I think, remain as to the very near alliance between the two.

The peculiar placentation of this Order was mentioned by me some years ago, (*Taylor's Magazine*, Nov. 1837). That their capsule consists of two carpels standing right and left of the axis of inflorescence, and with the margins not inflected in the form of dissepiments, is incontestable. Yet in *Orobanche* and *Phelypæa* the capsule has four placentæ, placed equidistant in pairs upon the face of each valve or carpel, and considerably within the margin. In *Epiphegus* each carpel has two intramarginal placentæ, which diverge from the base upwards, and terminate before reaching the apex. In *Lathræa* there is to each valve but one placenta, which may be regarded as two confluent ones occupying the very face of the dorsal suture of the carpel. And finally in *Æginetia indica*, and I believe in *Æginetia abbreviata* also, the placenta is in like manner confined to the axis of the valve, occupying the same position upon the carpels as in *Lathræa*, but broken up into a number of parallel plates of unequal depth, over the whole surface of which multitudes of minute seeds are distributed.

According to the observations of Vaucher, of Geneva, the seeds of *Orobanche ramosa* will lie many years inert in the soil unless they come in contact with the roots of Hemp, the plant upon which that species grows parasitically: when they immediately sprout. The manner in which the seeds of *Orobanche* attach themselves to the plants on which they grow has been observed by Schlauter. This writer states that they only seize seedlings, and are unable to attack roots of a stronger growth. When *Pieris hieracioides* is attacked, he found that the *Orobanche* seeds seize upon the points of the roots exclusively; the latter then swell and form an enlargement which serves for a base to the *Orobanche*.—*Ann. Sc. n. s.* 10. 318. Duchartre has studied with great diligence the development of *Clandestina*, in whose stem he finds neither medullary sheath nor medullary processes; and according to Messrs. de Mirbel, Richard, and Ad. Brongniart, the same remarkable structure occurs among *Figworts* in the case of *Melampyrum sylvaticum*.—*Ann. Sc. N. n. s.* xx. 145.

*Broomrapes* are not uncommon in Europe, particularly in the southern kingdoms, Barbary, the Cape of Good Hope, middle and northern Asia, and North America; they are very rare in India.

*Orobanche major* is a powerful, astringent, bitter plant, the infusion of which has been employed as a detergent application to foul sores, and internally to restrain alvine fluxes. *Epiphegus virginiana* is supposed to have formed, in conjunction with white oxide of arsenic, a famous cancer powder, which was known in North America under the name of Martin's Cancer Powder. It is thought to participate in the properties of *Orobanche major*. *Orobanche epithymum* is an old-fashioned bitter tonic, and vulnerary; and its fragrant flowers are used in spasmodic affections. *Lathræa Squamaria* roots were given in epilepsy, and *Clandestina* was supposed to counteract sterility in women: but these things are now forgotten. *Æginetia indica*, prepared with sugar and nutmeg, is considered an antiscorbutic. *Phelipæa lutea* dyes black the ropes that are prepared from the fibres of the Doom Palm of Thebes.

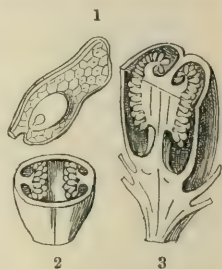


Fig. CCCCXIII.

Fig. CCCCXIII.—1. seed and embryo of *Conopholis americana*; 2. section of ovary of *Epiphegus americana*; 3. section of fruit of *Hyobanche sanguinea*.



## GENERA.

Epipogon, Nutt.	<i>Hieracium</i> , Wallr.	<i>Leptocarpus</i> , Link.	<i>Trigonotis</i> , Hoffm.
<i>Leptantherum</i> , Raf.	<i>Campanula</i> , Wallr.	<i>Asperula</i> , Hoffm.	<i>Centronotus</i> , Hoffm.
<i>Melanchia</i> , Wallr.	<i>Orobancha</i> , Linn.	<i>Asperula</i> , Hoffm.	<i>Centronotus</i> , Hoffm.
Phelipaea, Desf.	<i>Orobancha</i> , Wallr.	<i>Asperula</i> , Hoffm.	<i>Centronotus</i> , Hoffm.
<i>Trigonotis</i> , Wallr.	<i>Bombacina</i> , C. & M. p.	<i>Asperula</i> , Hoffm.	<i>Centronotus</i> , Hoffm.
<i>Koppea</i> , Dumort.	<i>Stellaria</i> , Fisch.	<i>Asperula</i> , Hoffm.	<i>Centronotus</i> , Hoffm.
<i>Orobancha</i> , Link.	<i>Clandestina</i> , Link.	<i>Asperula</i> , Hoffm.	<i>Centronotus</i> , Hoffm.

NUMBERS. GEN. 12. Sp. 109.

*Mentha*, Linn.

POSITION.—Gentianaceæ.—OROBANCHACEÆ.

*Gentiana*, Linn.

See further *De Cand. Prodr.* XI. 1, where the species are arranged by flamm. and  
excludes *Hyalanthe* and *Centronotus*, but does not indicate any other place for them.

## ADDITIONAL GENERA.

*Gentiana*, Linn.  
*Trigonotis*, Hoffm.  
*Centronotus*, Hoffm.

See further *Ann. Sc. Nat.*, 2 ser., XX. 145, and 3 ser., VIII. 168.



## ORDER CCXXXVI. GENTIANACEÆ.—GENTIANWORTS.

Gentianæ, *Juss. Gen.* 141. (1789); *R. Brown Prodr.* 449; *Von Martius Nov. Gen. &c.* 2. 132; *Bartl. Ord. Nat.* 199; *Royle's Illustrations*, 276; *Endl. Gen.* cxxxiv.; *Grisebach Monogr.* (1836); *Id. in Alph. DC. Prodr.* 9. 38.—*Desfontaineæ, Endl. Gen.* p. 669.

**DIAGNOSIS.**—*Gentianal Exogens, with no stipules, simple stigmas at the end of a manifest style, parietal placentæ, and regular flowers.*

Herbaceous plants, seldom shrubs, generally smooth, sometimes twining. Leaves opposite, entire, without stipules, sessile, or having their petioles confluent in a little



Fig. CCCCXIV.

sheath, in most cases 3-5-ribbed; very rarely brown and scale-like; sometimes alternate. Flowers terminal or axillary, regular, or very seldom irregular. Calyx divided, inferior, persistent. Corolla monopetalous, hypogynous, usually regular, and persistent; the limb regular, sometimes furnished with delicate fringes, its lobes of the same number as those of the calyx, generally 5, sometimes 4, 6, 8, or 10, occasionally extended at the base into a bag or spur, with a plaited, or folded, or imbricated twisted aestivation. Stamens inserted upon the corolla, all in the same line, equal in number to the segments, and alternate with them; some of them occasionally abortive. Ovary composed of 2 carpels, 1- or partly 2-celled, many-seeded. Style 1, continuous with the ovary; stigmas 2, right and left of the axis; ovules 00, anatropal, parietal. Capsule or berry many-seeded; when 2-valved, the margins of the valves turned inwards, and bearing the seeds. Seeds small; testa single; embryo minute in the axis of soft fleshy albumen; radicle next the hilum.

This Order is very near that of Dogbanes, from which it differs in the herbaceous habit, permanent corolla, entire ovary, parietal placentation, imbricated, not contorted aestivation, want of milk, and usually capsular fruit. The ribbed leaves too afford, in the majority of cases, a certain mark of distinction; to this may be added bitterness. Wherever the parietal placentæ can be found, and this is usually the case, the recognition of the Order is very easy; and in the anomalous genera, like *Sebeæa*, in which a partially 2-celled ovary exists, a little examination shows that in reality the placentæ merely meet at the base. From Figworts, in particular, this circumstance distinctly cuts Gentians off, independently of their minute embryo and symmetrical flowers. Von Martius remarks that no Gentianworts except *Tachia* have a hypogynous disk; and the two carpellary leaves of which the fruit is formed are lateral, or right and left with respect to the common axis of the inflorescence, their placentæ being consequently anterior and

Fig CCCCXIV.—*Gentiana amarella*. 1. section of the ovary of *Chironia baccifera*; 2. section of the ripe fruit; 3. a seed; 4. a vertical section of it.



posterior ; while in Figworts, Gasterworts, Liverworts, Acanthoids, and the Agnæ, a hypogynous disk is very common in the shape of a fleshy cone, or of glandular papilla, and the two carpellary leaves are anterior and posterior, the arrangement being transverse, on the same transverse line as that which separates the upper from the lower lip. Agnæ, furdia seems to connect this Order with Euphorbiæ ; and Verreauxia, a parasitical, seedy, leafless genus, offers a direct transition to Broomrapes.

A numerous Order of herbaceous plants, extending over almost all parts of the world, from the regions of perpetual snow upon the summits of the mountains of Europe, to the hottest parts of South America and India. They, however, do not appear in the Flora of Melville Island ; but they form part of that of the Straits of Magellan. The most common genus is *Gentiana*, concerning which and its allies, the following observations will be read with interest.

"Few genera display so full a series of colours in the flower as this does ; red, blue, yellow and white, are all exhibited in it, with many of the intermediate compound tints. Yellow and white are rare in the regions of the Gentians, but almost invariably present ; the red species are nearly confined to the Andes of South America and New Zealand. Amongst Dr. Janczow's Botanical Notes on the Flora of the Andes of Peru and Colombia, I find the following interesting remark : Of sixteen species of *Gentian* with which I am acquainted, one half are red, four purple, two blue, one yellow, and one white.—*Bot. Journ.* vol. ii. p. 649. Their inferior limit under the line we find, from the same source, to be 7852 feet, and they ascend from thence nearly to the limits of perpetual snow on Cotopaxi ; they do not in South America descend to the level of the sea in a lower latitude than 54° or thereabouts, where however there are no Alpine species, though the snow line does not descend below 4000—5000 feet. In the Himalaya, where the species are all blue-flowered, one species has been gathered by my friend Mr. Edgeworth, near Ratha Kona, on the Mena Pass, at an elevation of 15,000 feet, near the limit of perpetual snow ; and another reaches, in lat. 31 N., the altitude of 12,639, according to Dr. Royle. *Hort. Plant. Hensch.* vol. i. pp. 22 and 270. In Ceylon a species has been gathered at between 6000 and 8000 feet of elevation. One species, *G. prostrata*, H. B. K., has a most extraordinary range both in longitude and latitude ; in southern Europe it inhabits the Carinthian Alps, between 6000 and 9000 feet high ; in Asia it has been found on the Altai Mountains, about lat. N. 52°. Its American range is much more remarkable, it having been gathered on the tops of the rocky mountains in lat. 38° N. where they attain an elevation of 15,000—16,000 feet, and on the east side of the Andes of S. America, in 35° S. ; it flowers to the level of the sea in Behring's Straits in lat. 63½° N.

"The fact of the occurrence, and the great number, of species of *Gentiana* inhabiting only the more elevated regions of the temperate and tropical zones, and hence reaching the snow limit, renders it very remarkable that they should be so comparatively scarce in the higher latitudes both of the northern and southern hemispheres. Generally speaking, the inhabitants of these elevated and cold regions are supplied with Natural Orders and Genera as compose the mass of Polar vegetation. That as to a great extent with certain groups of Ranunculaceæ, Gramineæ, Cruciferae, Umbelliferae, Ericaceæ, &c., but not with Gentianeæ ; the proportion which the species of the mountain temperate zones bear to the other plants of these regions on the one hand, and to the tropical species on the other, is in both cases remarkably small. They are scarcely noticed in the Floras of the Polar and American Islands ; some few solitary individuals are found on the Arctic Sea shores in the North, or in some New Zealand Fjords, or the Antarctic Islands in the South ; and again in other groups of N. America and Alaska, or of Chili and Patagonia, they are infinitely less numerous than in the Alps of the middle and south Europe, or the Andes of the equator."—*See the History and Geology of the Alps*, p. 55.





The Order of Gentianworts is not more remarkable for the diversity of its colours than it is for the uniformity of the secretions which its various species exhibit. Bitterness in every part, root, leaves, flowers, fruit, in annuals, perennials, and shrubs, is so much their characteristic that the following account of the purposes to which they are applied is little more than a list of repetitions; with this exception, that they in some cases prove narcotic and emetic.

The common Gentian root of the druggists, a pure and intense bitter, is for the most part *Gentiana lutea*, an herbaceous plant, with axillary whorls of yellow flowers, common on the Alps of Europe. It is principally employed as a tonic, but sometimes relaxes the bowels, producing nausea and a kind of intoxication. *G. campestris* and *Amarella*, common on the heaths and hills of some parts of England, are domestic substitutes; as are *G. Catesbæi* in the United States, *G. Kurroo* in the Himalayas, and *G. punctata*, *pannonica*, *purpurea*, and others, on the Continent of Europe. *G. cruciata* has been superstitiously believed to possess especial virtues because its leaves grow in the form of a cross, and it is one of the thousand panaceas for hydrophobia. *Agathotes Chirayta*, a Himalayan annual, is remarkable for the pureness of its bitter. The whole plant is pulled up at the time the flowers begin to decay, and dried for use. Its febrifugal properties are in high estimation with European practitioners in India, who use it instead of *Cinchona* when the latter is not to be procured. *Cicendia hyssopifolia*, a common Indian annual, *Erythraea Centaurium* (Centaury), a beautiful little wild plant, with pink flowers, *Chlora perfoliata*, various species of *Lisianthus*, *Tachia*, *Sabbatia*, *Coutoubea*, &c. &c., possess qualities very nearly of the same kind, varying principally in intensity, and are employed as substitutes for Gentian in different countries. The root of *Frazera Walteri*, a North American biennial, is a pure, powerful, and excellent bitter, destitute of aroma, and is fully equal to Gentian. When fresh it is reported to be emetic and cathartic. The roots have been imported into Europe as a sort of *Calumba*, and have acquired in consequence the name of American *Calumba*. *Menyanthes trifoliata*, a common bog plant, called Buck Bean (quasi Bach or Beck, *i. e.* Brook Bean) is intensely bitter. Its rhizome is reckoned one of the most valuable of known tonics; but large doses produce vomiting, and frequently powerful diaphoresis. It is recommended in intermittent and remittent fevers, gout, herpetic complaints, rheumatism, dropsy, scurvy, and worms. Withering says that it may be used as a substitute for Hops in making beer. *Villarsia nymphoides* acts in a similar way, but is weaker.

#### GENERA.

<p><b>I. GENTIANEÆ.</b>—Corolla imbricated.</p> <p><i>Gentiana</i>, Tournef.</p> <p><i>Asterias</i>, Ren.</p> <p><i>Calantha</i>, Frœl.</p> <p><i>Colantha</i>, Borkh.</p> <p><i>Dasystephana</i>, Ren.</p> <p><i>Cuttera</i>, Raf.</p> <p><i>Pneumonanthe</i>, Bung.</p> <p><i>Dasycephala</i>, Borkh.</p> <p><i>Cyminalis</i>, Borkh.</p> <p><i>Thylactes</i>, Ren.</p> <p><i>Crossocephalum</i>, Frœl.</p> <p><i>Crossopetalum</i>, Roth.</p> <p><i>Urananthe</i>, Gaud.</p> <p><i>Gentianella</i>, Borkh.</p> <p><i>Ericala</i>, Ren.</p> <p><i>Ericoila</i>, Bork.</p> <p><i>Calathiana</i>, Frœl.</p> <p><i>Chondrophyllum</i>, Bung.</p> <p><i>Erithalia</i>, Bung.</p> <p><i>Tetrorkiza</i>, Ren.</p> <p><i>Endotriche</i>, Frœl.</p> <p><i>Eurythalia</i>, Ren.</p> <p><i>Cyanea</i>, Ren.</p> <p><i>Oreophylax</i>, Endl.</p> <p><i>Pleurogyne</i>, Eschsch.</p> <p><i>Lomatogonium</i>, A. Br.</p> <p><i>Trochantha</i>, Bung.</p> <p><i>Swertia</i>, Linn.</p> <p><i>Stellera</i>, Turcz.</p> <p><i>Anagallidium</i>, Griseb.</p> <p><i>Ophelia</i>, Don.</p> <p><i>Monobothrium</i>, Hochs.</p>	<p><i>Agathotes</i>, Don.</p> <p><i>Henricca</i>, Lem. Lis.</p> <p><i>Fraseria</i>, Walt.</p> <p><i>Halenia</i>, Borkh.</p> <p><i>Tetragonanthus</i>, Stell.</p> <p><i>Chironia</i>, Linn.</p> <p><i>Restinia</i>, Mönch.</p> <p><i>Plocandra</i>, E. Mey.</p> <p><i>Gyandra</i>, Gris.</p> <p><i>Orphium</i>, E. Mey.</p> <p><i>Valerandia</i>, Neck.</p> <p><i>Exacum</i>, Linn.</p> <p><i>Lapethea</i>, Gris.</p> <p><i>Voyra</i>, Aubl.</p> <p><i>Vohiria</i>, Juss.</p> <p><i>Lita</i>, Schreb.</p> <p><i>Humboldtia</i>, Neck.</p> <p><i>Leiphaïmos</i>, Schlecht.</p> <p><i>Ixanthus</i>, Griseb.</p> <p><i>Hippion</i>, Spreng.</p> <p><i>Slevogtia</i>, Reichenb.</p> <p><i>Cicendia</i>, Adans.</p> <p><i>Microcala</i>, Link. et H.</p> <p><i>Franquevillia</i>, Gray.</p> <p><i>Hippocentaurica</i>, Schl.</p> <p><i>Centaurella</i>, L. C. Rich.</p> <p><i>Centaurium</i>, Pers.</p> <p><i>Bartonia</i>, Mühlenb.</p> <p><i>Andrescia</i>, Spreng.</p> <p><i>Erythraea</i>, Ren.</p> <p><i>Xantha</i>, Reichenb.</p> <p><i>Zygostigma</i>, Griseb.</p> <p><i>Canscora</i>, Lam.</p> <p><i>Pladera</i>, Sol.</p>	<p><i>Hoppea</i>, Willd.</p> <p><i>Poolia</i>, Dennst.</p> <p><i>Orthostemon</i>, R. Br.</p> <p><i>Sabbatia</i>, Adans.</p> <p><i>Chlora</i>, Linn.</p> <p><i>Blackstonia</i>, Huds.</p> <p><i>Xanthanthus</i>, Griseb.</p> <p><i>Callophisma</i>, M. et Zucc.</p> <p><i>Dejanira</i>, Cham.</p> <p><i>Schultesia</i>, M. et Z.</p> <p><i>Hockinia</i>, Gardn.</p> <p><i>Anacotus</i>, Griseb.</p> <p><i>Pagæa</i>, Griseb.</p> <p><i>Petalostylis</i>, Griseb.</p> <p><i>Omphalostigma</i>, Gris.</p> <p><i>Lisianthus</i>, Aubl.</p> <p><i>Lisianthus</i>, Linn.</p> <p><i>Macrocarpæa</i>, Griseb.</p> <p><i>Sphaerocarpæa</i>, Griseb.</p> <p><i>Choriophyllum</i>, Gris.</p> <p><i>Chelonanthus</i>, Griseb.</p> <p><i>Irlbachia</i>, Mart. et Zucc.</p> <p><i>Helia</i>, Mart. et Zucc.</p> <p><i>Eustoma</i>, Don.</p> <p><i>Urananthus</i>, Griseb.</p> <p><i>Leianthus</i>, Griseb.</p> <p><i>Coutoubea</i>, Aubl.</p> <p><i>Cutubea</i>, Mart. et Zucc.</p> <p><i>Picrium</i>, Schreb.</p> <p><i>Prepusa</i>, Mart. et Zucc.</p> <p><i>Tachia</i>, Griseb.</p> <p><i>Symbolanthus</i>, Don.</p> <p><i>Tachia</i>, Aubl.</p> <p><i>Myrmecia</i>, Schreb.</p>	<p><i>Leiothamnus</i>, Griseb.</p> <p><i>Eudoxia</i>, Don.</p> <p><i>Crawfordia</i>, Wall.</p> <p><i>Belmontia</i>, E. Mey.</p> <p><i>Exochaenium</i>, Gris.</p> <p><i>Sebæa</i>, Soland.</p> <p><i>Lagenias</i>, E. Mey.</p> <p><i>Schubleria</i>, Mart.</p> <p><i>Curtia</i>, Cham.</p> <p><i>Thurnheissera</i>, Pohl.</p> <p><i>Apophragma</i>, Griseb.</p> <p><i>Exadenus</i>, Griseb.</p> <p><i>Desfontainia</i>, R. et S.</p> <p><i>Linkia</i>, Pers.</p> <p>? <i>Henicostemma</i>, Blum.</p> <p>? <i>Tripterospermum</i>, Blm.</p> <p>? <i>Micræa</i>, Miens.</p> <p><i>Glyphospermum</i>, Don.</p> <p><b>II. MENYANTHEÆ.</b>—Corolla induplicate.</p> <p><i>Menyanthes</i>, Linn.</p> <p><i>Menonanthus</i>, Haw.</p> <p><i>Villarsia</i>, Vent.</p> <p><i>Nymphaeanthe</i>, Rchb.</p> <p><i>Renealmia</i>, Houtt.</p> <p><i>Trachysperma</i>, Raf.</p> <p><i>Cumada</i>, Jon.</p> <p><i>Limnanthemum</i>, Gmel.</p> <p><i>Nymphoides</i>, Tournef.</p> <p><i>Waldschmidia</i>, Wigg.</p> <p><i>Schweyckheria</i>, Gmel.</p> <p>? <i>Mitreola</i>, Linn.</p> <p><i>Cynoctonum</i>, Gmel.</p>
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NUMBERS. GEN. 60. Sp. 450.

*Cinchonaceæ.*

POSITION.—*Orobanchaceæ.*—GENTIANACEÆ.—

*Polemoniaceæ.*



(Gentianaceae *contracta*.)

## ADDITIONAL GENERA

<i>Veronica</i> <i>M.</i>		
<i>Desfontainia</i> <i>M.</i>		
<i>Desfontainia</i> <i>M.</i>		
<i>Desfontainia</i> <i>M.</i>		
<i>Desfontainia</i> <i>M.</i>		

(Desfontainia probably belongs to some very different Order.)

## ALLIANCE XLVI. SOLANALES.—THE SOLANAL ALLIANCE.

DIAGNOSIS.—*Perigynous* flowers, with *dichlamydeous*, *monopetalous*, *monotheca* *protruding* *axile* *placenta*, 2-3-celled *fruit*, *large* *embryo*, *large* or a *small* quantity of *albumen*.

All these plants are clearly held together by the common character of a *monogamous* corolla, *axile* *placenta*, *regular* *symmetrical* flowers, and an *isotridic* *albumen*. It is the last circumstance, with the *axile* *placenta*, which distinguishes them from the *Gentianal* Alliance. The free central *placenta* of *Caryophyllaceae* closely distinguishes that Alliance.

Here and there anomalous genera occur, with no corolla, or syconate petals, but they are rare, and do not seem to invalidate the Alliance, which joins *Gentianaceae* to *Oliveworts*, which are nearly allied to *Ebenads* and *Hollyworts*, and joins *Desfontainia* to the *Polemoniads*, which are so very near *Hydrophyllaceae* that the two were blended in the same Natural Order.

Lateral affinities are here very important. Nothing whatever except the agreement of their flowers separates *Nightshades* from *Figworts* in the *Bignonial* Alliance; *Oliveworts* touch *Jasmineworts* among *Echials*; *Asclepiads*, *Dogbanes* in *Gentianaceae*, and *Bindweeds* the *Nolanads* of the *Echial* Alliance.

## NATURAL ORDERS OF SOLANALES.

<i>Stamens</i> free, 2 or 4 . . . . .	251. <i>Gentianaceae</i>
<i>Stamens</i> free, 5. <i>Placenta</i> axile. <i>Embryo</i> <i>terete</i> . . . . .	252. <i>Solanaceae</i>
<i>Authors</i> and <i>stigma</i> consolidated into a <i>calyx</i> . . . . .	253. <i>Asclepiaceae</i>
<i>Stamens</i> free, 5. <i>Placenta</i> axile. <i>Corolla</i> <i>leafy</i> , <i>folded</i> <i>longitudinally</i> . . . . .	254. <i>Caryophyllaceae</i>
<i>Stamens</i> free, 5. <i>Placenta</i> basal. <i>Corolla</i> <i>leafy</i> , <i>folded</i> <i>up</i> . . . . .	255. <i>Hydrophyllaceae</i>
<i>Stamens</i> free, 5. <i>Placenta</i> basal. <i>Embryo</i> <i>stiff</i> , <i>spiral</i> . . . . .	256. <i>Cruciferae</i>
<i>Stamens</i> free, 5. <i>Placenta</i> axile. <i>Corolla</i> <i>straight</i> , <i>glabrous</i> . . . . .	257. <i>Passifloraceae</i>



## ORDER CCXXXVII. OLEACEÆ.—OLIVEWORTS.

Oleaceæ, *Hoffmannsegg et Link Fl. Port.* (1806); *Brown Prodr.* 522.—Lilaceæ, *Vent. Tabl.* 1. 306. (1799).—Fraxineæ, *Martius Conspectus*, No. 209. (1835).—Oleaceæ, *Ed. pr. ccxxvi.* (1836); *Endl. Gen. cxxx.*; *DC. Prodr.* 8. 273.

DIAGNOSIS.—*Solanal Exogens*, with 2 or 4 free stamens.

Trees or shrubs. Branches usually dichotomous and ending abruptly by a conspicuous bud. Leaves opposite, simple, sometimes pinnated. Flowers in terminal or



Fig. CCCCXVI.

axillary racemes or panicles; the pedicels opposite, with single bracts. Flowers ♂ or ♀. Calyx divided, persistent, inferior. Corolla hypogynous, monopetalous, 4-cleft, occasionally of 4 petals connected in pairs by the intervention of the filaments, sometimes absent; aestivation somewhat valvate. Stamens 2 (in *Tessarandra* 4), alternate with the segments of the corolla, or with the petals; anthers 2-celled, opening longitudinally. Ovary simple, without any hypogynous disk, 2-celled; the cells 2-seeded; the ovules pendulous and collateral; style 1 or 0; stigma bifid or undivided. Fruit drupaceous, berried, or capsular, often by abortion 1-seeded. Seeds with dense, fleshy, abundant albumen; embryo about half its length, straight; cotyledons foliaceous; radicle superior; plumule inconspicuous.

These plants resemble Jasmineworts in many respects, and Endlicher even thinks them allied to that Order alone; indeed they are combined by Ach. Richard. Reichenbach thinks Oliveworts related to Storaxworts, because, according to Hayne (*Arzngw.* xi. 23. *adn. ult.*), a sort of storax is yielded by *Olea europæa*. De Candolle suggests (*Essai Méd.* p. 204.) that the Ash is related to the Maples, and this view is lately

adopted by Von Martius; I also find in the same work the following very good observations upon this Order:—"However heterogeneous the Oliveworts may appear as at present limited, it is remarkable that the species will all graft upon each other; a fact which demonstrates the analogy of their juices and their fibres. Thus the Lilac will graft upon the Ash, the *Chionanthus*, and the *Fontanesia*, and I have even succeeded in making the Persian Lilac live ten years on *Phillyrea latifolia*. The Olive will take on the *Phillyrea*, and even on the Ash: but we cannot graft the Jasmine on any plant of the Olive tribe: a circumstance which confirms the propriety of separating these two Orders." To me I confess that the unsymmetrical flowers of Jasmineworts offer a great difficulty in the way of placing them in even the same Alliance as Oliveworts, the more especially because that peculiarity is connected with a decidedly nucamentaceous fruit. The two stamens usually present in Oliveworts may be taken to show that the flowers of the Order are really  $\frac{2}{2}$ , which is confirmed by *Tessarandra*, which has 4 stamens; the two stamens of Jasmineworts are probably connected with a quinary type. The true affinity seems to be with Nightshades, as is indicated by the dicarpellary fruit, regular symmetrical monopetalous corolla, axile placenta, and undivided fruit of both Orders.

Natives chiefly of temperate latitudes, inclining towards the tropics, but scarcely known beyond 65° N. lat. The Ash is extremely abundant in North America; the *Phillyreas* and *Syringas* are all European or Eastern plants. A few are found in New Holland and elsewhere within the tropics. One Ash is a native of Nipal.

From the pericarp of *Olea europæa*, the common Olive, is obtained by pressure the well-known substance called Olive Oil; the medical properties of which are demulcent,

Fig. CCCCXVI.—*Notelaea ovata*. 1. flower; 2. fruit.—Endlicher.



emollient, and laxative. It enters extensively into the preparation of plasters, liniments, cerates, ointments, and enemas. As an external application, uncounteracted by continued friction of the skin, it has been found too brutal in promoting the continuation of the plague. The bark is bitter and astringent, and has been proposed sometimes as a substitute for Cinchona, according to De Cadeville. It also contains a resinous gum, or rather a gum-like substance, once in request as a vulnerary. The wood of those of *Olea fragrans* are employed in China for flavouring tea. *Hamamelis virginica*, purgative, called Manna, is a concrete discharge from the bark of several species of Ash, but especially from *Fraxinus retundata*. The secretion of this substance is due to the presence of sugar, but to a distinct principle, called Mucilage, which when from sugar is not fermenting with water and yeast. *Fraxinus excelsior* (the common Ash) not only yields Manna, in the warm climate of the south of Europe, but in Senegal, producing an unequivocal action upon the Fallopian. The fruiting branches of the Lilac, *Syringa vulgaris* are undoubted. In that part of the progress of fever called Brenne, which is marshy and insubstantial to the last degree, the present remedy is another remedy for the intermittent fever which prevails there. According to M. de Linné, quality is apparently owing to a principle which he calls Lilacine. — *Pharmac. Jussieu* 1. Linn.

## GENERA

I. OLEÆ.—Fruit a drupe or berry.

*Chionanthus*, Linn.  
*Linociera*, Swartz.  
*Thoukara*, Swartz.  
*Myrica*, Flor. Flum.  
*Tessandria*, Mart.  
*Mayopon*, Aubl.  
*Fraxinus*, Scop.  
*Ceanothus*, Schreb.

*Boeria*, A. DC.  
*Sorbus*, A. DC.  
*Olea*, Linn.  
*Picea*, A. DC.  
*Viburnum*, A. DC.  
*Phyllon*, Tourn.  
*Osmanthus*, Linn.  
*Nectaria*, Pers.  
*Rhynchospora*, Gärtn.  
*Steleodermis*, Trist.

*Fraxinus*, Linn.

*Myrica*, Linn.

*Chionanthus*, Linn.

*Thoukara*, Linn.

*Myrica*, Linn.

*Fraxinus*, Linn.

*Myrica*, Linn.

*Fraxinus*, Linn.

*Fraxinus*, Linn.  
*Myrica*, Linn.  
*Chionanthus*, Linn.  
*Thoukara*, Linn.  
*Myrica*, Linn.  
*Fraxinus*, Linn.  
*Myrica*, Linn.  
*Fraxinus*, Linn.

NUMBERS. GEN. 24. Sp. 150.

POSITION.—

*Fraxinus*, Linn.  
*Olea*, Linn.  
*Thoukara*, Linn.

*Viburnum*, Linn.  
*Osmanthus*, Linn.  
*Chionanthus*, Linn.



FIG. CCCCXVI.\*

Fig. CCCCXVI.\* 1. flower of *Linociera*; 2. cross section of fruit, showing an abortive seed; 3. cross section of fruit, showing an abortive seed; 4. cross section of fruit, showing an abortive seed.



## ORDER CCXXXVIII. SOLANACEÆ.—NIGHTSHADES.

*Solanaceæ*, Juss. Gen. 124. (1789) ; R. Brown Prodr. 443 ; Bartl. Ord. Nat. 193 ; Schlecht. in *Linnaea*, 7. 66. (1832) ; Nees v. Esenbeck in *Linn. Trans.* 17. 37. (1834).—*Solanaceæ*, Ed. Pr. cxxviii. (1836) ; Endl. Gen. cxlviii. ; Meisner, p. 272.—*Cestrinæ*, Martius *Conspectus*, No. 121. (1835).—*Cestraceæ*, Ed. Pr. cxxix.—*Retziaceæ*, Bartl. Ord. Nat. (1830) ; Endl. Gen. p. 669.

DIAGNOSIS.—*Solanal* Ecogens, with 5 free stamens, axile placentæ, and a terete embryo.

Herbaceous plants or shrubs. Leaves alternate, undivided, or lobed, sometimes collateral ; the floral ones sometimes double, and placed near each other. Inflorescence

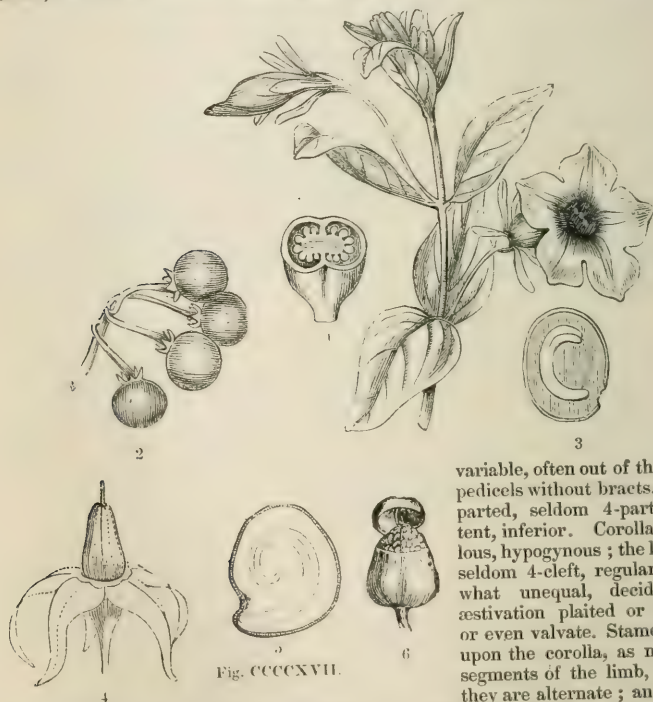


Fig. CCCXVII.

variable, often out of the axil ; the pedicels without bracts. Calyx 5-parted, seldom 4-parted, persistent, inferior. Corolla monopetalous, hypogynous ; the limb 5-cleft, seldom 4-cleft, regular, or somewhat unequal, deciduous ; the aestivation plaited or imbricated, or even valvate. Stamens inserted upon the corolla, as many as the segments of the limb, with which they are alternate ; anthers bursting longitudinally, rarely by pores, at the apex. Ovary 2-celled, composed of a pair of carpels right and left of the axis, rarely 4- 5- or many-celled, with polyspermous placentæ ; style continuous ; stigma simple ; ovules 00, amphitropal. Pericarp with 2, or 4, or many cells, either a capsule with a double dissepiment parallel with the valves, or a berry with the placentæ adhering to the dissepiment. Seeds 00 ; embryo straight or curved, often out of the centre, lying in fleshy albumen ; radicle near the hilum.

The anthers of *Solanum* open by pores. *Nicotiana multivalvis* has many cells in the capsule, so has *Lycopersicon* ; *Nicandra* is 5-celled, *Datura* 4-celled.

Brown remarks, that this Order is chiefly known from Figworts by the curved or spiral embryo, the plaited aestivation of the corolla, and the flowers being regular, with the same number of stamens as lobes. Hence the genera with a corolla not plaited, and at the same time a straight embryo, should, he thinks, either be excluded, or placed in a separate section, along with such as have an imbricated corolla, a slightly curved em-

Fig. CCCXVII.—*Petunia violacea*. 1. a cross section of the ovary ; 2. ripe fruit of *Solanum Dulcamara* ; 3. a section of one of its seeds ; 4. flower of *Solanum Dulcamara* ; 5. a section of its seed ; 6. pyxis of *Hyoscyamus*.



bryæ, and didynamous stamens. It does not, however, appear necessary to promote the latter as a distinct Order, but it is better to understand them as growing apart from the condition of Figworts, which are in fact nothing but unguiculate *Nightshades*. In reality, the *Nightshades* are the equivalent, in the Natural Alliance, of the *Figworts* among *Bignoniales*; and these two Alliances are brought into direct contact by placing in the Orders in question, although in a broad average sense, that they both follow each other. It is quite certain, I think, that no other distinction between *Nightshades* and *Figworts* exists, for the curved embryo of the former, although remarkable in many instances, is not at all to be depended upon, because the nature of the embryo varies in very nearly allied species. Thus in *Pentstemon nyctaginthoides* before the embryo is bent and twisted embryo of *Nightshades*; but in *Pentstemon* yielding the embryo of a single strand he externally distinguished from those of the latter, but even when lying side by side upon the field of the microscope, the embryo is perfectly straight and evenly plumed; in *Salpiglossis straminea* the embryo is curved and pointed apically; yet in all other characters the genus agrees with *Figworts*; finally, in *Nicotiana glauca*, which is not the doubt being a genuine species of *Nightshade*, the embryo is greatly enlarged. We therefore are obliged to conclude that a false importance has been given to this, as a certainly has to a great many other microscopic characters; a fault which has not escaped the acuteness of Fries. I do not, however, conceive that *Figworts* and *Nightshades* ought readily to stand in the same Alliance, because the latter have a peculiar tendency to lose the dicarpellary structure of the former, as is seen in *Nourdes*, which has a single, and in the many-celled *Lycopersacors* and *Nicotianas*. No such tendency occurs in the *Bignoniales*.

The most immediate affinity of *Nightshades* seems to be with *Olivaceous* and *Blue* weeds, to the latter of which their numerous twining species bring them very close, while the first division of the Order stands on the very threshold of *Olivaceous*. Compare, for instance, *Syringa* and *Cestrum*. At the same time several essential affinities are extremely well marked. That of *Figworts* has already been mentioned. Others are approached by *Trochoneuræ*, whose stamens are scarcely epipetalous. *Malvaceæ*, as *Schlechtendahl*, is considered by that author to be a transition between *Nightshades* and *Boragaceæ*. He, however, regards its affinity to *Lycium* (bushy), and points out its near relation to *Nolana*. (See *Linnæus*, 7, 71). Mr. Walter Arnot believes no difference from *Nightshades* in the small number of its seeds. *Linnæus*, 11, says, "*Solanads* are also close to *Grabowskya*, and would very well stand in the Solan. Alliance if their fruit were not mucamentaceous."

Natives of most parts of the world without the arctic and antarctic circles, especially within the tropics, in which the mass of the Order exists, in the form of the genera *Solanum* and *Physalis*. The number of species of the former genus is very great in tropical America, and the whole amount to twice as many as all the other combinations.

At first sight this Order seems to offer an exception to the general principle laid in structure and sensible qualities which is so characteristic of well defined Natural Orders, containing as it does the deadly *Nightshade* and *Hellbore*, and the edible *Potato* and *Tomato*; but a little inquiry will explain this apparent anomaly. The leaves and berries of the *Potato* are narcotic; it is only its tubers that are edible when cooked. This is the case with other succulent underground stems in equally dangerous families, as the *Cassava* among *Spargaceæ*; but, as *DeCandolle* justly observes—"Il ne faut pas perdre de vue que tous nos aliments (céréales, légumes, &c.) sont en fait narcotiques et excitants, but in different degrees, from *Atropa* *Belladonna*, which causes vertigo, convulsions, and vomiting, following which not infrequently produce the first and last of these symptoms, *Hyoscyamus* and *Scopolia* lead to some *Solanums*, the leaves of which are used as cathartic herbs. The various species may be classed according as they are, 1, narcotic or poisonous; 2, emetic; 3, diuretic; 4, pungent; 5, bland or inert. 1. As to poisonous species, the most of these is perhaps the *Acocanthera venenata*, a large herb with disagreeable leaves found at the Cape of Good Hope; a decoction of the herb, infused in the decoction of yucca is used by the *Hottentots* to envenom their weapons. It is said to be a bad poison, and to be also used by the same people to destroy wild beasts by impregnating their flesh with its juice. Similar qualities have been ascribed to the *Crotalaria* *hyperphyllum* and *nocturnum*. Others, however, more famous to Europeans are hardly to be regarded as inferior in virulence. The *Thorn-apple* (*Datura Stramonium*) is a violent narcotic when taken internally; in small doses it is a powerful medicine in treating epilepsy, convulsions, tic-douloureux, &c.; it soothes the distressing paroxysms of spasmodic asthma, when smoked. *Datura Tabernaemontana* and *Mandragora* are similar agents; the latter is used by *Orientals* as an opiate, the former by the *North American* Indians.



than Stramonium ; the seeds are the most powerful part of these plants, and are stated by some authors to have been used by the priests of the Delphic Temple, to produce those frenzied ravings which were called prophecies. Such a practice certainly obtains, or obtained, in the Temple of the Sun, in the city of Sagomozo, where the seeds of the Floripondio (*Datura sanguinea*) are used ; the Peruvians also prepare from them an intoxicating beverage which stupefies if taken much diluted ; but, when strong, brings on attacks of furious excitement. Henbane (*Hyoscyamus niger*), a common biennial weed, is a powerful narcotic at the time when its seeds are forming, though comparatively inert at an earlier period. Its capsules and seeds, as well as its leaves, are used extensively in medicine, and produce effects similar to those of Opium. But the former, when taken too freely, are apt to bring on temporary insanity. All the other species of *Hyoscyamus* have a similar action. In some parts of the Greek continent the stalks of *Hyoscyamus albus* are used against toothache. They are dried and employed in lieu of Tobacco, for smoking. In England the seeds of *H. niger* are occasionally employed for the same purpose, with useful effect.—*Ann. Ch.* 1. 249. *Atropa Belladonna* is another dangerous narcotic. Every part of the plant is poisonous ; and children and the ignorant have often suffered from eating the berries, the beautiful appearance and sweet taste of which render them very alluring. The symptoms which they induce are those of intoxication, accompanied with fits of laughter and violent gestures ; great thirst, difficulty of deglutition, nausea, dilatation of the pupil, with the eyelids drawn down ; redness and tumefaction of the face, stupor or delirium, a low and feeble pulse, paralysis of the intestines, convulsions, and death. In medicine *Belladonna* is not only narcotic, but diaphoretic and diuretic. It is extensively employed, especially in producing a dilatation of the pupil, when its infusion is dropped into the eye. Among other properties it is said by Hahnemann and Koreff to protect the individual who takes it from the contagion of scarlatina. According to Mr. Pereira it is supposed to be the plant which produced such remarkable and fatal effects upon the Roman soldiers during their retreat from the Parthians (See *Plutarch's Life of Antony*). Buchanan relates that the Scots mixed the juice of *Belladonna* with the bread and drink which by their truce they were to supply the Danes, which so intoxicated them, that the Scots killed the greater part of Sweno's army while asleep.—*Rev. Scot. Hist. lib.* 7. "The insane root that takes the reason prisoner," mentioned by Shakspeare (*Macbeth*, I. iii.), is also thought to be this. Mandrake, formerly considered an *Atropa*, but now called *Mandragora officinalis*, has an action of a similar nature ; it has had an exaggerated reputation as an aphrodisiac, was largely used in amorous incantations, and its forked root, which by a little contrivance is easily made to assume the human form (see *Flora Græca*), has led to the foolish stories of the plant shrieking when torn out of the ground. By the Arabs the plant is called Tufah-al-Sheitan, or Devil's Apple. The best commentators regard the Mandrake as the Dudaim of Scripture, in which Dr. Royle concurs (See *Biblical Cyclopædia*, p. 587). It is a little remarkable that although it is generally believed that the Mandrake does not possess any power of inciting the passion of love, yet a nearly allied plant, *Jaborosa* or *Himeranthus runcinatus*, is employed in the same manner among the South Americans. Tobacco, the use of which has now become to many persons as indispensable as bread, is the foliage of various species of *Nicotiana* ; all the American Tobacco is furnished by *N. Tabacum* or its varieties, the Persian by *N. persica*, and the Syrian by *N. rustica*. It is a powerful stimulant narcotic, employed medicinally as a sedative, and in vapour to bring on nausea and fainting. When chewed it appears to impair the appetite and induce torpor of the gastric nerves. Although if smoked in moderate quantities it acts as a harmless excitant and sedative, yet it is a frequent cause of paralysis when the practice is indulged in to excess. Oil of Tobacco, which is inhaled and swallowed in the process of smoking, is one of the most violent of known poisons. The Hottentots are said to kill snakes by putting a drop of it on their tongues, and the death of these reptiles is said to take place as instantaneously as if by an electric shock ; dangerous symptoms are reported to have followed the application of the ointment to scald heads. Solanums, although far less active than these dangerous plants, are by no means destitute of poisonous qualities in some species.

An extract of the leaves of the common Potato (*Solanum tuberosum*) is a powerful narcotic, ranking between *Belladonna* and *Conium* ; according to Mr. Dyer it is particularly serviceable in chronic rheumatism, and painful affections of the stomach and uterus.—*Pharm. Journ.* 1. 590. *Solanum Dulcamara*, the Bittersweet, is a strong narcotic in its foliage, and its berries are by no means safe, although it does appear that in some cases they have been taken into the stomach without inconvenience. *Solanum nigrum*, a very common weed in all parts of the world except the coldest, is more active. A grain or two of the dried leaf has sometimes been given to promote various secretions, possibly by exciting a great, and rather dangerous, agitation in the viscera. It is



a narcotic, and, according to Orfila, its natural properties destroy the most gross of vegetable poisons. In Brazil it is called *Camelhão*, or *Erva Mala*, and is often found applied either as poultice or bath to painful wounds. Finally, whether the seeds be of narcotics, it will be sufficient to mention *Physalis peruviana*. One plant, however, is here the *Solanum* instead of *Physalis*. It is known to be generally bitter, and alexipharmic. The leaves steeped in oil are, for a long time, applied to cancerous tumours; and they are used in a similar way in Egypt. *Solanum* is employed in all the tropical climates.

The fruits are comparatively few. The Queen of Brazil is the production of a true pseudo-pine, and is so powerful a bitter and tonic, that the Physicians generally believe that it is not the genuine Jesuit's tree. It has been analysed by Vauquelin, and found that it contained a kind of a bitter resinous matter, slightly soluble in water, with 1-12th of a vegetable bitter, and a number of other principles in common with *Cestrum* *Hortulanum*, *auriculatum*, *longifolium*, and *Pseudopanax*. Some persons, however, Martin thinks that the bitterness of these fruits is owing to some foreign principle residing in their bark. Several are found to have a disagreeable taste, but *Solanum* he named *Physalis pubescens*, viscosa, longifolia, and *Allouéa* (the *White Cherry*). *Necandra* *polygalifolia*, *Solanum* *marginatum*, *pubescens*, *nigrum*, and *guianense*, with many species of *Cestrum*, such as *glabrum*, *Arctostaphylos*, *erythrorhizon*, *Prunell* and *Imbricatum*. The latter are generally at the same time emollient, and are applied to the breasts in cleansing wounds and ulcers. We are told, moreover, that the sweetest kind of unripe fruits are much employed by the Brazilians as a remedy of the food not to cutaneous vesicle. A decoction of the flowers and leaves of *Solanum* *marginatum* is a powerful sudorific, and is very serviceable in syphilis, gonorrhoea, erysipelas, and other complaints.

The cases of pungency are confined to the fruit of the genus *Capsicum*; a great numerous species are found in the tropics. The fruit and seed are powerful stimulants. The well-known condiment called *Cayenne Pepper* consists principally of the green seeds. It is employed in medicine, in combination with opium, in rheumatism and lethargic affections, and also in gastric cost, dyspepsia accompanied by nausea, torpors, paralysis, &c. Its most violent application appears to be in erysipelas, maligna and scarlatina maligna, used either as a poultice or solution externally. It is generally stated that *Capsicums* have no narcotic quality; but it would appear that some of the American species are an exception to that rule, as is the case with *Capsicum* *marginatum*; this, however, requires confirmation. That some species have fruits which are neither narcotic nor pungent in any considerable degree, if at all, is more probable, as many of them are common articles of food or remedy. But it is stated that the poisonous species derive their properties from the presence of a pulpy matter which surrounds the seeds; and that the whole seed links are destitute of this pulp, the juice consisting only of what Botanists call the sarcocarp; that is to say, the centre of the seed, very more or less succulent state. This is not, however, a point he yet seemed well established. Tomatoes, the fruit of the *Lycopersicon*, commonly called *Love Apples*, in allusion to the supposed power which they possess of exciting venery, belong to a common ingredient in sauces. Egg Apples, also called *Amorcan*, *Amorcan*, are produced by *Solanum* *Melongena*; but they are uneatable till the seed has been removed. Several are much esteemed as being the source of *Ichama maritimum* and *peruviana* are extremely eaten, and those of *S. peruviana* are called *Quito Oranges* (*Naranjos de Quito*). Many species, as the *Mandarin Apples* are as harmless as they are beautiful and fragrant; and the *Rose Apple*, as is named by *Solanum* *lacinatum*, is a common food among the Portuguese. Mr. Macbride states, however, that although when perfectly ripe it may be eaten with impunity, yet, while unripe, it is acrid and produces a burning sensation in the throat.

The common Potato, in a state of putrefaction, is said to give out a steam small, but sufficient to read by. This was particularly remarked by an officer on guard at a barracks, who thought the barracks were on fire, in consequence of the light steam arising from a cellar full of Potatoes.

*Solanum* *marginatum* is used in Abyssinia for tanning leather. &c. &c. The berries of *Solanum* *nigrum* are employed in America in making a "Pain expeller" for the garrison. *Nierembergia* *lanceolata* is sent to the Governor of the Argentine republic to be very poisonous to horses. *Morus* *Paraguayensis* is used in Seville as a substitute for meat, by cooking *Chamouille*.

In addition to the foregoing statement, I enclose the following remarks by Mr. Miers, the learned investigator of this order:—

"The differential characters that for a long while served to mark the limits of the Scrophulariaceæ and Solanaceæ, were that the former were distinguished by a corolla more or less bilabiate, with an imbricated aestivation, and by a more or less



and a straight or slightly curved embryo ; while the latter possessed a regular corolla, five equal stamens, and a spirally curved embryo ; but it was found, as stated in p. 619, that the amount of curvature of the embryo and the more or less didynamous character of the stamens were features too variable to be depended upon. So long as the anomalous cases were few, the rule was maintained for the sake of convenience, but as science advanced, the exceptions became seriously multiplied, and in order to obviate farther difficulty, Mr. Bentham combined a number of these anomalies into a

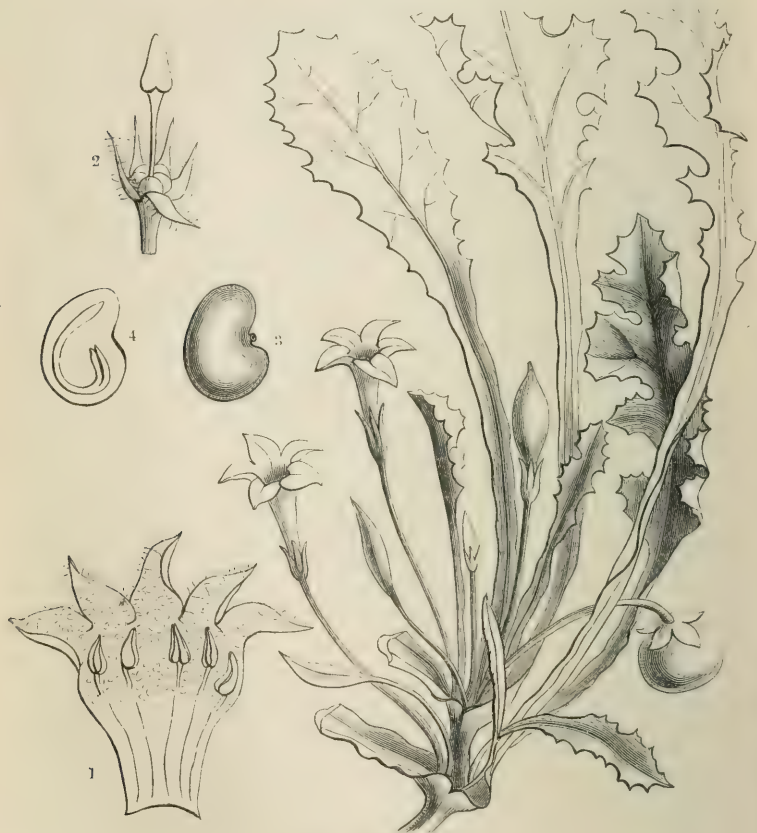


Fig. CCCCXVII. *bis*.

distinct and osculant tribe, the Salpiglossidæ, which he arranged at the head of the Scrophulariaceæ. Within the last few years the writer of this note has investigated the family of the Solanaceæ with the object of defining not only the exact limit of its several genera, but of establishing more obvious landmarks between these two natural orders. This research has brought to light a great number of new facts, showing other cases of pentamerous flowers with imbricate æstivation, and a far greater number in which the æstivation is neither imbricate, nor valvate or induplicato-valvate, but an intermediate state resulting from different modifications of the imbricate. The exceptional cases were now found to amount to as many as the number of all the genera of the true Solanaceæ, and it therefore remained a question of some importance how they could be disposed of. There were only three modes of doing so ; 1st, by placing them in Solanaceæ, but that would annihilate the only valid distinguishing feature of that family ; 2nd, to admit them among the Scrophu-



lariceæ, but this would be equally incompatible with its botanical characters, or of 3rd, to arrange them all in an intermediate family, by which the distinctive features of the two sister great orders would be preserved intact. The latter alternative appears therefore the only practicable one, and would bring them all under the limits of such divisions as in this summary account, viz.

1. **SCROPHULARIACEÆ**, having flowers consistent with monogamous vegetation.
2. **SOLANACEÆ**, having flowers hermaphrodite, with a calyx, or calyxes, in aestivation.
3. **ATROFACIÆ**, having flowers isomerous or nearly so, with no calyxes, or with imbricated or some modification of it.

\* According to these views, I propose to transfer the *Antirrhineæ* to those genera with a monopetalous corolla, having a 5- or rarely 4-partite border, the lobes of which (even under the unusual circumstance of the tube being divided into nearly equal and equal, and their margins always valvate or induplicate, imbricate or subimbricate) epipetalous stamens alternate with and equal to the number of the lobes, sometimes unequal in length and size, and the fifth very rarely wanting; anthers opening, mostly by longitudinal slits or pores; an ovarium most generally bilobed, rarely 2- or 3-celled, with a simple style and a 2-lobed or almost 4-angled stigma often bifid; a 2- or 3-locular, rarely more-celled, fruit, rarely more-celled than the increase of the placenta; albuminous seeds with an embryo in the umbilical circumference always terete, and curved in a more or less similar or equal form, in the former Keetembryæ short and straight, the radicle in all cases pointing out to one side, not to the basal angle of the seed, and turned away to somewhat more than half the length, which is generally lateral and somewhat marginal, but never basal. These genera plants with alternate, often geminate, rarely pinnatifid leaves with an induplicate sometimes axillary, but more generally a little exserted, or almost entire, simple or fasciculated, or in different modifications of the entire pinnate, or pinnatifid.

\* The **SCROPHULARIACEÆ** will consist of those genera, possessing a tubular corolla more or less curved and irregular, with a 4- or 5-partite border, the lobes of which are generally unequal and bilabiate, and decidedly imbricate, never valvate or subimbricate; stamens 2 or 4, didymous, rarely 5 or 6, with a rudimentary fifth without anther, or an ovary most generally bilocular, a simple style, with a stigma with or less bilabiate or 2-lobed; fruit almost always capsular, but very few sometimes 2-locular, rarely more-celled, bursting in different ways, with placentæ adnate to the dissepiment. Seeds albuminous, with an embryo quite straight or hardly curved, generally with the radicle pointed towards a basal hilum: in our western genera the embryo is peripherally curved, and in the *Rhinanthæ*, by an abnormal curvature of the podosperm, the hilum appears somewhat lateral. In the *Scrophulariæ* family, although the floral leaves are often alternate, the corolla lobes, and most generally opposite, a circumstance that occurs only accidentally in *S. chinensis*. The latter genus is strictly axillary.

\* The **ATROFACIÆ** will comprise all the *Antirrhineæ* excepting the *Antirrhineæ* which in the *Solanaceæ* and *Scrophulariaceæ*, and will include plants with monopetalous flowers with the tube often plicated longitudinally in bud, but a longer tube, more or less unequal, but never bilabiate, generally divided into 2 lobes, never more, and the lobes either imbricately disposed in aestivation or arranged in the same manner between that form and the induplicate, but never valvate, the margins of which being constantly free from the adjoining edges, they have generally 5 fertile stamens alternate with the lobes, one of them sometimes sterile and long, rarely 3 of them sterile; anthers generally introrse, sometimes extrorse, usually with parallel cells bursting longitudinally, one of the long ones sometimes sterile; ovary 2-celled, rarely with other spines, with a stigma with or without growth of the placenta, with ovules generally pendulous, attached to the ovary, adnate to the dissepiment as in the two preceding families, always with a central stigma often of a peculiar form; fruit either capsular or saccate, with generally reniform and compressed with a lateral hilum, the embryo placed in the middle, either straight or more or less curved, sometimes equal, with the radicle in the *Solanaceæ*, always turned away from the more lateral base. However, some of the shrubs with a habit similar to that of the *Solanaceæ*, with alternate, simple, entire or fasciculate leaves; inflorescence generally somewhat racemose, and inserted in regard to the insertion of the pedicel.

\* The family of the *Atrofaciæ* is divided into tribes by the following manner, the tribe being distinguished by some particular kinds of aestivation or other peculiar feature; these characters the reader may consult by reference to the work already quoted, where a full diagnosis and illustrated description are given of nearly every genus of this order, as well as of the *Solanaceæ*.



## "1st Tribe. NICOTIANEÆ.

*Nicotiana*, *Tournef.*  
*Tabacus*, *Mönch.*  
*Codylis*, *Rafin.*  
*Nyctagella*, *Reichenb.*  
*Tabacum*, *Reichenb.*  
*Tabacina*, *Reichenb.*  
*Lehmannia*, *Spr.*  
*Satranthus*, *Don.*  
*Polydichlis*, *Miers.*  
*Polydichlia*, *Don.*

## 2nd Tribe. DATUREÆ.

*Datura*, *Linn.*  
*Stramonium*, *Tournef.*  
*Dutra*, *Bernh.*  
*Ceratocaulis*, *Bernh.*  
*Brugmansia*, *Pers.*

## 3rd Tribe. DUBOISEÆ.

*Duboisia*, *Br.*  
*Anthocercis*, *Lab.*  
*Anthotroche*, *Endl.*

## 4th Tribe. SCHIZANTHEÆ.

*Schizanthus*, *R. & P.*

## "5th Tribe. SALPICLOSSIDEÆ.

*Salpiglossis*, *R. & P.*  
*Pteroglossis*, *Miers.*  
*Leptoglossis*, *Benth.*  
*Browallia*, *Linn.*  
*Streptosolen*, *Miers.*

## 6th Tribe. PETUNIEÆ.

*Petunia*, *Juss.*  
*Callibrachoa*, *Llav.*  
*Leptophragma*, *Benth.*  
*Nierembergia*, *Benth.*  
*Bouchetia*, *DC.*

## 7th Tribe. HYOSCYAMEÆ.

*Hyoscyamus*, *Tournef.*  
*Scopolia*, *Jacq.*  
*Scopolina*, *Schultz.*  
*Physochlana*, *Miers.*  
*Belenia*, *Decne.*  
*Physoclaina*, *Don.*  
*Cacabus*, *Bernh.*  
*Thinogeton*, *Benth.*  
*Dictyogalyx*, *Hook. fil.*  
*Anisodus*, *Link.*  
*Whitleya*, *Sweet.*

## 8th Tribe. LEUCOPHYLLÆ.

*Leucophyllum*, *Bonpl.*

## "9th Tribe. ATROPEÆ.

*Atropa*, *Linn.*  
*Belladonna*, *Tournef.*  
*Nicandra*, *Adans.*  
*Calydermos*, *R. & P.*  
*Cliocarpus*? *Miers.*  
*Mandragora*, *Tournef.*  
*Lycium*, *Linn.*

## 10th Tribe. SOLANDREÆ.

*Solandra*, *Sw.*  
*Swartzia*, *Gmel.*  
*Marckea*, *L. C. Rich.*  
*Lamarckea*, *Pers.*  
*Juanulloa*, *R. & P.*  
*Ulloa*, *Pers.*  
*Laureria*, *Schlecht.*  
*Portea*, *Tenore.*  
*Sarcophysa*, *Miers.*  
*Ectozoma*, *Miers.*

## 11th Tribe. BRUNSFELSIEÆ.

*Brunsfelsia*, *Plum.*  
*Franciscoa*, *Pohl.*  
*Heteranthia*, *Nees & Mart.*  
*Vrodichia*, *Spr.*

"The following is the arrangement of the SOLANACEÆ as I would leave them :—

"1<sup>o</sup>. Suborder.  
RECTEMBRYEÆ.

## 1st Tribe. METTERNICHIEÆ.

*Metternichia*, *Mik.*  
*Sessea*, *R. & P.*

## 2nd Tribe. CESTREÆ.

*Cestrum*, *Linn.*  
*Habrothamnus*, *Endl.*  
*Meyenia*, *Schlecht.*

## 3rd Tribe. FABIANEÆ.

*Fabiana*, *R. & P.*  
*Vestia*, *Willd.*  
*Schwenkia*, *Linn.*  
*Chatochilus*, *Vahl.*  
*Mathea*, *Vell.*

2<sup>o</sup>. Suborder.  
CURVEMBRYEÆ

## 4th Tribe. JABOROSEÆ.

*Jaborosa*, *Juss.*  
*Dorystigma*, *Miers.*  
*Himeranthus*, *Endl.*  
*Trechonetes*, *Miers.*  
*Salpichroma*, *Miers.*  
*Busbeckia*, *Mart.*  
*Perizoma*, *Miers.*  
*Planchonia*, *Dun.*  
*Nectouxia*, *H. B. K.*

## "5th Tribe. IOCHROMEÆ.

*Dyssochroma*, *Miers.*  
*Ioichroma*, *Benth.*  
*Chaenesthes*, *Miers.*  
*Anisodontus*, *G. Don.*  
*Cleochroma*, *Miers.*  
*Lycioplesium*, *Miers.*  
*Precilochroma*, *Miers.*  
*Hebecladus*, *Miers.*  
*Codochonia*, *Dun.*  
*Dunalia*, *H. B. K.*  
*Dierbachia*, *Spr.*  
*Acnistus*, *Schott.*  
*Phrodus*, *Miers.*

## 6th Tribe. PHYSALÆÆ.

*Physalis*, *Linn.*  
*Alkekengi*, *Tournef.*  
*Herschelia*, *Bowd.*  
*Pentaphragmum*, *Reichenb.*  
*Larnax*, *Miers.*  
*Margaranthus*, *Schlecht.*  
*Withania*, *Pauq.*  
*Hypnoticum*, *Rodr.*

## 7th Tribe. WITHERINGIÆÆ.

*Witheringia*, *Herit.* (non *Mart.*)  
*Saracha*, *R. & P.*  
*Bellenia*, *R. & Sch.*  
*Jaltomata*, *Schl.*

## "Bassovia, Aubl.

*Witheringia*, *Mart.* (non *Herit.*)  
*Athenaea*, *Sendter.*  
*Aureliana*, *Sendter.*  
*Cliocarpus*? *Miers.*  
*Brachistus*, *Miers.*  
*Fregiardia*, *Dun.*  
*Discopodium*, *Hochst.*  
*Helsenbergia*, *Tausch.*  
*Punneeria*, *Stocks.*  
*Sicklerr*, *Sendter.*  
*Capsicum*, *Tournef.*

## 8th Tribe. SOLANEÆ.

*Solanum*, *Linn.*  
*Melongena*, *Tournef.*  
*Pseudocapsicum*, *Mön.*  
*Nycterium*, *Vent.*  
*Androcera*, *Nutt.*  
*Ceranthera*, *Rafin.*  
*Acquartia*, *Jacq.*  
*Cyphomandra*, *Sendter.*  
*Pionandra*, *Miers.*  
*Cynanostyles*, *Schott.*  
*Pallavicinia*, *de Notaris*  
*Triguera*, *Cav.*  
*Lycopersicon*, *Tournef.*  
*Psolanum*, *Neck.*

*Scrophulariaceæ.*

POSITION.—Oleaceæ.—SOLANACEÆ.—Convolvulaceæ.  
*Nolanaceæ.*



## ORDER CCXXXIX. ASCLEPIADACEÆ.—AMARFORÆ.

Apocynaceæ, *Juss. Gen.* 141. (1789, in part).—*Asclepiadaceæ*, B. Brown, *Philosoph. Trans.* 8: 27. (1800).  
*Prodr.* 438. (1819). *Leaves* (1820, 222). (1821). (1822). (1823). (1824). (1825). (1826). (1827). (1828). (1829). (1830).  
 2, p. 77. (1831). *Leaves* (1831). (1832). (1833). (1834). (1835). (1836). (1837). (1838). (1839). (1840).

DIAGNOSIS.—*Scand. Erect. or with the pithy and spongy (sometimes) root-system.*

Shrubs, or occasionally herbaceous plants, almost always milky, and often creeping. Leaves entire, opposite, sometimes alternate or whorled, having often between their petioles in lieu of stipules. Flowers somewhat umbellated, fascicled, or racemose, proceeding from between the petioles. Calyx 5-divided, persistent. Corolla monopetalous, hypogynous, 5-lobed, regular, with imbricated, very seldom valvular, aestivation, deciduous. Stamens 5, inserted into the base of the corolla, alternate with the segments of the limb. Filaments usually connate. Anthers 2-celled, sometimes almost 4-celled in consequence of their dissepiments being nearly complete. Pollen at the period of the dehiscence of the anther cohering in masses, either equal to the number of the cells, or occasionally cohering in pairs and sticking to 5 processes of the stigma either by twos, or fours, or singly. Ovaries 2; styles 2, closely approaching each other, often very short; Stigma common to both styles, dilated, 5-cornered, with corpusculiferous angles. Follicles 2, one of which is sometimes abortive. Placenta attached to the suture, finally separating. Seeds numerous, imbricated, pendulous, almost always comose at the hilum. Albumen thin. Embryo straight. Cotyledons foliaceous. Radicle superior. Plumule inconspicuous.

For a long time the real structure of the present Order was misunderstood; but Brown, in a Dissertation in the *Transactions of the Wernerian Society*, placed its true nature beyond doubt. I subjoin the explanation given by this celebrated Botanist, who thus describes the flower of *Asclepias syriaca*.

"The flower-bud of this plant I first examined while the involucral leaves were green and considerably shorter than the calyx. At this period the petals are hidden

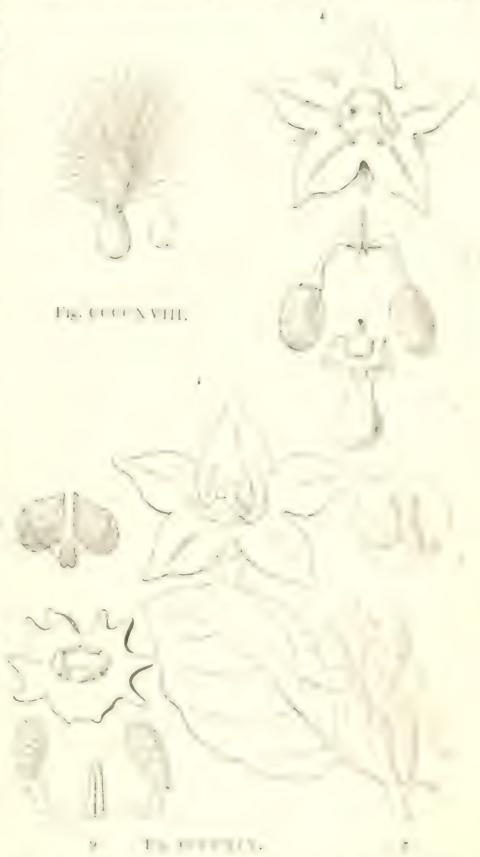


Fig. CCCXVIII.—Seed and embryo of *Asclepias syriaca*.

Fig. CCCXIX.—1. flower of *Gynostemma pentaphyllum*; 2. flower of *Gynostemma pentaphyllum*; 3. flower of *Gynostemma pentaphyllum*; 4. flower of *Gynostemma pentaphyllum*; 5. flower of *Gynostemma pentaphyllum*; 6. flower of *Gynostemma pentaphyllum*; 7. flower of *Gynostemma pentaphyllum*; 8. flower of *Gynostemma pentaphyllum*.



which afterwards occupy the angles of the stigma were absolutely invisible ; the furrows of its angles were extremely slight, and, like the body of the stigma, green ; the antheræ, however, were distinctly formed, easily separable from the stigma, and their cells, which were absolutely shut, were filled with a turbid fluid, the parts of which did not so cohere as to separate in a mass ; of the cuculli, which in the expanded flower are so remarkable, and constitute the essential character of the genus, there was no appearance.

"In the next stage submitted to examination, where the corolla nearly equalled the calyx in length, the gland-like bodies of the stigma were become visible, and consisted of 2 nearly filiform, light-brown, parallel, contiguous, and membranaceous substances, secreted by the sides of the furrow, which was now somewhat deeper. Instead of the filiform processes, a gelatinous matter occupied an obliquely descending depression proceeding from towards the base of each side of the angular furrow.

"In a somewhat more advanced stage, the membranes which afterwards become glands of the stigma were found to be linear, closely approximated, and to adhere at their upper extremity. At the same time the gelatinous substance in the oblique depression had acquired a nearly membranaceous texture and a light-brown colour ; and on separating the glands from its furrow, which was then practicable, this membrane followed it. At this period, too, the contents of each cell of the antheræ had acquired a certain degree of solidity, a determinate form, and were separable from the cell in one mass ; the cuculli were also observable, but still very small and green, nearly scutelliform, having a central papilla, the rudiment of the future horn-like process. Immediately previous to the bursting of the cells of the antheræ, which takes place a little before the expansion of the corolla, the cuculli are completely formed, and between each, a pair of minute, light-green, fleshy teeth are observable, the single teeth of each pair being divided from each other by the descending alæ of the antheræ. The glands of the stigma have acquired a form between elliptical and rhomboidal, a cartilaginous texture, and a brownish-black colour ; they are easily separable from the secreting furrow, and on their under surface there is no appearance of a suture, or any indication of their having originally consisted of two distinct parts ; along with them separate also the descending processes, which are compressed, membranous, and light-brown ; their extremity, which is still unconnected, being more gelatinous, but not perceptibly thickened. The pollen has acquired the yellow colour, and the degree of consistence which it afterwards retains. On the bursting of the cells, the gelatinous extremity of each descending process becomes firmly united with the upper attenuated end of the corresponding mass of pollen. The parts are then in that condition in which they have been commonly examined, and are exhibited in the figures of Jacquin, who, having seen them only in this state, naturally considered these plants as truly gynandrous, regarding the masses of pollen as the antheræ, originating in the glands of the stigma, and merely immersed in the open cells of the genuine antheræ, which he calls antheriferous sacs ; an opinion in which he has been followed by Rottbøll, Kœlreuter, Cavanilles, Smith, and Desfontaines. The conclusion to be drawn from the observations now detailed is sufficiently obvious ; but it is necessary to remark, that these observations do not entirely apply to all the plants which I have referred to the Asclepiadæ ; some of them, especially *Periploca*, having a granular pollen, applied in a very different manner to the glands of the stigma ; they all, however, agree in having pollen coalescing into masses, which are fixed or applied to processes of the stigma, in a determinate manner ; and this is, in fact, the essential character of the Order. Dr. Smith, in the second edition of his valuable *Introduction to Botany*, has noticed my opinion on this subject : but, probably from an indistinctness in the communication, which took place in conversation, has stated it in a manner somewhat different from what I intended to convey it to him ; for, according to his statement, the pollen is projected on the stigma. The term projection, however, seems to imply some degree of impetus, and at the same time presents the idea of something indeterminate respecting the part to which the body so projected may be applied. But nothing can be more constant than the manner in which the pollen is attached to the process of the stigma in each species."

Brown, who first distinguished Asclepiads, stated that they differed solely in the peculiar character of their sexual apparatus ; but this was of so unusual a kind in Asclepiads, as to justify a deviation from the general rule, that Orders cannot be established upon solitary characters. In *Dogbanes* the stamens are distinct, the pollen powdery (that is to say, in the ordinary state), the stigma capitate and thickened, but not particularly dilated, and all these parts distinct the one from the other. But in Asclepiads the whole of the sexual apparatus is consolidated into a single body, the centre of which is occupied by a broad disk-like stigma, and the grains of pollen cohere in the shape of waxy bodies attached finally to the 5 corners of this stigma, to which they adhere by the intervention of peculiar glands.

The Order is one of those which contain indifferently what are called succulent plants



and such as are in the usual state of cellular tissue, which sometimes disengages from the cellular tissue of the stem, and reduction of that of the leaves, as seen in the greatest degree in *Stapelia* and *Cerepegia*: is denominated as Ductless, the secretions of which are confined to the leaves; and almost disappears in those of the stem of which is in the usual state, but the leaves between fleshy and leathery.

It has already been stated, under the Order of Dogbanes, that the resemblances found between that Order and Asclepiads seemed to be one of analogy rather than of real affinity; for the economy of the flowers and seeds in the two Orders are widely different. The ancyrtaloid embryo of Asclepiads, with hardly a trace of albumen, is entirely different from that of Dogbanes, which is very small, and furnished most abundantly with albumen. The anthers and stigma of Dogbanes form no organic union, but they grow into one solid central mass in the Asclepiads, whence proceed other physiological and structural peculiarities.

Other Botanists do not attach the same importance to these circumstances, and continue to associate the two Orders, adopting the opinion of Brown, who considered that they differed solely in the nature of their stamens and stigma, the stamens of Dogbanes being distinct with powdery pollen, and those of Asclepiads adherent to the tub-shaped stigma, the pollen being contained in bags, formed by the separation of the endothecium. And M. A. De Candolle has recently taken the same view of the matter. Ann. Sci. Nat. 7, p. 255. He even shows that the distinction found in the stamens and part of Dogbanes and Asclepiads is not so positive as it is supposed to be, for there are Asclepiads with stamens free from their very base, and small stigmas, while on the other hand some Dogbanes have filiform appendages at the end of their anthers, and great glandular stigmas to which the anthers adhere with force. He even thinks that the only real distinction resides in the pollen, the grains of which are always separate in Dogbanes, always in waxy masses or bags in Asclepiads. The reason why these great Botanists attach small importance to the albumen as a distinction, is doubtless because, in some Dogbanes, such as *Cerbera*, that secretion is absent, although in the mass of the same it is most abundant; but it is, I think, evident that the tendency among Dogbanes to form albumen in abundance, and that no such tendency exists among Asclepiads.

Africa must be considered as the great field of Asclepiads, especially its western point, where vast numbers of the succulent species occupy the dry and arid plains of that remarkable country. In tropical India and New Holland, and in all the equatorial parts of America, they also abound. Two genera only are found in northern latitudes, one of which, *Asclepias*, has many species, and is confined apparently to North America; the other, *Cynanchum*, is remarkable for extending from the north latitude to 32° south latitude. A *Stapelia* is found in Sicily.

The roots are generally acrid and stimulating, whence some of them are considered as *Tylophora asthmatica* and *Securone emetica*; others are diaphoretic and sudorific, as the purgative *Asclepias decumbens*, which has the singular property of exciting general perspiration without increasing in any perceptible degree the heat of our body; it is constantly used in Virginia against pleurisy. Their milk is usually sweet and bitter, and is always to be suspected, although it probably participates in a slight degree only in the poisonous qualities of that of Dogbanes, if we can judge from the use of some species as articles of food. *Cerepegia* (cactis), *Oxygonia succulentum*, and *Sarcostemma*, *Forskaldium*, and *stipitaceum*, are all reported to be useful. The Cow Plant of Ceylon, or *Kiriaghna* plant, *Gynura latifolia*, called a *gula*, in which the Cingalese make use for food; its leaves are also used when boiled. But very little is known about the real qualities of such plants, and as to *Oxygonia succulentum*, Roxburgh says he did not find that the natives ever used it, and Dr. Wight makes the same statement; adding, however, that in its use it is used by a people for aphthous affections of the mouth and fauces. The root and leaf of *Asclepias viridiflora* sicken and excite expectoration. *Asclepias tuberosa*, or *Henocallis*, must be a popular remedy in the United States for a variety of diseases; its properties seem to be those of a mild cathartic, and of a certain diaphoretic, with an inconsiderable expectorant effect. A decoction of *Asclepias tuberosa* of Wild (from the West Indies) is used by the Negroes as a vomit and purgative, and it is said to be



PL. ASCLEP.



efficacious in gleans and fluor albus. The roots of *Tylophora asthmatica* are acrid, and used on the coast of Coromandel as a substitute for *Ipecacuanha*. Dr. Roxburgh found it to answer the same purpose as that drug, and had also very favourable reports of it from others. Dr. J. Anderson, Physician-General at Madras, confirms this; it was used with great success in a dysentery that was in his time epidemic in the British camp. No doubt it is one of the most valuable medicines in India. In large doses it is emetic; in smaller doses often repeated it acts as a cathartic. Burnett states it to be valuable as a sudorific, and to be peculiarly beneficial in humoral asthma. Similar qualities are possessed by *Sarcostemma glaucum*, the *Ipecacuanha* of Venezuela. The *Cynanchum acutum* and *Vincetoxicum officinale* are both drastics; the former produces a drug called Montpellier Scammony. The milk of *Periploca græca* is very acrid, and has been employed by Orientals as a wolf-poison; *Gonolobus macrophyllus* is reputed to have furnished the North American Indians with a juice to poison their arrows. The root and bark, and especially the inspissated milk, of *Calotropis gigantea*, the *Akund*, *Yercum*, or *Mudar* plant of India, is a powerful alterative and purgative; it is especially in cases of leprosy, elephantiasis, intestinal worms, and venereal affections that it has been found important. The leaves of *Solenostemma Argel* are used in Egypt for adulterating Senna, but whether intentionally or from mere carelessness is uncertain. They form a large proportion of some samples of Alexandrian (Nubian) Senna; but they are more bitter than those of Senna, and according to Guibourt are unsafe to administer, in consequence of their irritating properties. It is said that *Gomphocarpus fruticosus*, also called *Argel* or *Arghel* in Syria, is employed for the same purpose. The roots of *Hemidesmus indicus*, from which Mr. Garden obtained Smilasperic acid, are largely employed in India as a substitute for Sarsaparilla. Its diuretic effect is remarkable. It also acts as a diaphoretic and tonic. An account of the *Hemidesmus* has been published by Mr. Bell, *Pharm. Journ.* 3. 239. It is administered in the form of a syrup; but an infusion and decoction have been used, the proportions being the same as those adopted in the decoction of Sarsaparilla; viz. two ounces of the root to a pint of water. It is more than probable that caoutchouc is contained in several, for *Cynanchum* ? *ovalifolium*, according to Wallich, yields excellent caoutchouc at Penang; the tenacity of some species may be owing to its presence, as of *Marsdenia tenacissima*, employed for bowstrings by the mountaineers of Rajmahl; the fibre of this plant, and of *Urtica tenacissima*, was the strongest Roxburgh ever met with. *Orthanthera viminea*, attaining a height of 10 feet, is also remarkable for the length and tenacity of its fibre. Some species yield indigo of excellent quality, as *Marsdenia tinctoria*, found in Sylhet, and *Gymnena* ? *tingens*. See *Royle's Illustrations*, p. 274, for much more interesting matter connected with the sensible properties of plants of this Order, and especially of the *Mudar*.

# GENERA.

## I. PERIPLOCEÆ.

*Cryptostegia*, R. Br.  
*Zucchellia*, Dec.  
*Tacazea*, Dec.  
*Æchmolepis*, Dec.  
*Gymnanthera*, R. Br.  
*Camptocarpus*, Dec.  
*Finlaysonia*, Wall.  
*Hemidesmus*, R. Br.  
*Brachylepis*, Wight et A.  
*Decalepis*, Wight et Arn.  
*Streptocaulon*, Wight et A.  
*Harpanema*, Dec.  
*Atherandra*, Dec.  
*Phyllanthera*, Blume.  
*Lepistoma*, Blume.  
*Leposma*, Blum.  
*Periploca*, L.  
*Campelepis*, Falc.  
*Myriopterion*, Griff.  
*Pentoretia*, Dec.  
*Ectadium*, E. Mey.

## II. SECAMONEÆ.

*Secamone*, R. Br.  
*Goniostemma*, Wight.  
*Toxocarpus*, Wight et A.

## III. ASCLEPIADEÆ VERÆ.

*Mitostigma*, Dec.  
*Asaphanus*, R. Br.  
*Hamax*, E. Mey.

*Hemipogon*, Dec.  
*Nautonia*, Dec.  
*Steinhillia*, Dec.  
*Microloma*, R. Br.  
*Metaplexis*, R. Br.  
*Urostelma*, Bunge.  
*Parapodium*, E. Mey.  
*Barjonia*, Dec.  
*Pycnostelma*, Dec.  
*Menastelma*, R. Br.  
*Roulinia*, Dec.  
*Ensenia*, Nutt.  
*Ampelanus*, Raf.  
*Cordylagne*, E. Mey.  
*Xysmalobium*, R. Br.  
*Odontanthera*, Wight.  
*Periglossum*, Dec.  
*Glossostephanus*, E. Mey.  
*Podostigma*, Ell.  
*Stylandra*, Nutt.  
*Anantherix*, Nutt.  
*Acerates*, Ell.  
*Polyothus*, Nutt.  
*Vincetoxicum*, Manch.  
*Pentagonium*, Schauer.  
*Blittia*, W. Arn.  
*Haplostemma*, Endl.  
*Oncinema*, W. Arn.  
*Orthosia*, Dec.  
*Cynacetonum*, E. Mey.  
*Bunburia*, Harv.  
*Pycnoneurum*, Dec.  
*Holostemma*, R. Br.

*Solenostemma*, Hayn.  
*Argelia*, Dec.  
*Araujia*, Brot.  
*Physanthus*, Mart.  
*Schubertia*, Mart. et Zuc.  
*Calotropis*, R. Br.  
*Eutropis*, Falc.  
*Pentatropis*, R. Br.  
*Kanahia*, R. Br.  
*Sarcostemma*, R. Br.  
*Oxystelma*, R. Br.  
*Dœnia*, R. Br.  
*Hockea*, Endl.  
*Eustegia*, R. Br.  
*Peplonia*, Dec.  
*Decanema*, Dec.  
*Endotropis*, Endl.  
*Cynanchum*, Linn.  
*Pentarrhinum*, E. Mey.  
*Schizoglossum*, E. Mey.  
*Glossonema*, Dec.  
*Conomitra*, Fenzl.  
*Aspidoglossum*, E. Mey.  
*Lagararium*, E. Mey.  
*Rhinolobium*, W. Arn.  
*Gomphocarpus*, R. Br.  
*Asclepias*, L.  
*Apocynum*, Tourn.  
*Ditassa*, R. Br.  
*Tassadia*, Dec.  
*Calostigma*, Dec.  
*Oxypetalum*, R. Br.  
*Guthofreda*, Vent.

*Schistogyne*, Hook. et Arn.  
*Melinia*, Dec.  
*Brachylepis*, Hk. et A.  
*Sonninia*, Rehb.  
*Diptolepis*, R. Br.  
*Morrenia*, Lindl.  
*Turrigeria*, Dec.  
*Rhyssostelma*, Dec.  
*Seutera*, Reich.  
*Lyonia*, Ell.

## IV. GONOLOBÆÆ.

*Matelea*, Aubl.  
*Hostea*, Willd.  
*Gonolobus*, Michx.  
*Ibatia*, Dec.  
*Macrocephalus*, H. B. K.  
*Fischeria*, DC.  
*Lachnostoma*, H. B. K.  
*Pherotrichis*, Dec.  
*Polystemma*, Dec.  
*Blepharodon*, Dec.  
*Nephradenia*, Dec.  
*Dictyanthus*, Dec.  
*Chthamalia*, Dec.

## V. STAPELIÆ.

*Ptycanthera*, Dec.  
*Tenaris*, E. Mey.  
*Tylophora*, R. Br.  
*Hybanthera*, Endl.



*Asterostemma*, *W.*  
*Crotonostemma*, *W.*  
*Peruvia*, *W.*  
*Martiana*, *R. Br.*  
*Synanthus*, *R. Br.*  
*Croton*, *W.*  
*Dioscorea*, *L. Meg.*  
*Peruvia*, *L.*  
*Stephanotis*, *Thunb.*  
*Gymnema*, *R. Br.*  
*Hidaria*, *W.*  
*Gomphocarpus*, *W.*  
*Sarcocolla*, *R. Br.*  
*Trichostema*, *W.*

*Rhynchospora*, *F. W.*  
*Orthocentrus*, *W.*  
*Martiana*, *R. Br.*  
*Peruvia*, *W.*  
*Stephanotis*, *Thunb.*  
*Gymnema*, *R. Br.*  
*Hidaria*, *W.*  
*Gomphocarpus*, *W.*  
*Sarcocolla*, *R. Br.*  
*Trichostema*, *W.*

*Orthocentrus*, *W.*  
*Martiana*, *R. Br.*  
*Peruvia*, *W.*  
*Stephanotis*, *Thunb.*  
*Gymnema*, *R. Br.*  
*Hidaria*, *W.*  
*Gomphocarpus*, *W.*  
*Sarcocolla*, *R. Br.*  
*Trichostema*, *W.*

*Orthocentrus*, *W.*  
*Martiana*, *R. Br.*  
*Peruvia*, *W.*  
*Stephanotis*, *Thunb.*  
*Gymnema*, *R. Br.*  
*Hidaria*, *W.*  
*Gomphocarpus*, *W.*  
*Sarcocolla*, *R. Br.*  
*Trichostema*, *W.*

NUMBERS 1-10. FIG. 100-100.

POSITION. Convolutum. Asclepiadaceæ. Solanaceæ.



FIG. 100-100.

From specimens of the *Martiana* plant forwarded to Dr. Maclean by the *Peruvia* that species would appear to be *Calatropis* (now *Calatropis*) *W.* *C. gigantea*. The root of *Gomphocarpus* pedunculatus, which grows in the *Abyssinia*, under the name of *Eritrea*, is the same as the *Calatropis* of *Vignalliana*, which, when cooked, resembles *Jerusalem Artichoke*. *A. Richard*

ADDITIONAL SPECIES

*Pentameris*, *Bl.*  
*Phyllanthus*, *Bl.*  
*Asterostemma*, *Bl.*  
*Dioscorea*, *R.*  
*Cryptanthus*, *R. Br.*  
*Leptanthus*, *Bl.*  
*Mastostemma*, *Strob.*, near *Croton*.

Pentameris.

*Orthocentrus*, *W.*  
*Martiana*, *R. Br.*  
*Peruvia*, *W.*  
*Stephanotis*, *Thunb.*  
*Gymnema*, *R. Br.*  
*Hidaria*, *W.*  
*Gomphocarpus*, *W.*  
*Sarcocolla*, *R. Br.*  
*Trichostema*, *W.*

FIG. 100-100. *S. Martiana*. 1. The stamen (from the *Peruvia*); 2. The pistil (from the *Peruvia*); 3. The pistil (from the *Peruvia*); 4. The pistil (from the *Peruvia*).



## ORDER CCXL. CORDIACEÆ.—SEBESTENS.

*R. Brown Prodr.* 492. (1810); *Martius N. G. et Sp.* 2. 138, both without a name.—*Cordiaceæ*, *Link Handb.* 1. 569. (1829); *Endl. Gen.* cxlii.—*Arguziæ*, *Link.*—*Borragineæ Cordiææ*, *Alph. DC. Prodr.* 8. 467.

**DIAGNOSIS.**—*Solanales Exogens*, with 5 free stamens, axile placenta, and leafy cotyledons, folded longitudinally.

Trees. Leaves alternate, scabrous, without stipules, of a hard harsh texture. Flowers panicled, never gyrate, with minute bracts.



Fig. CCCCXXII.

Calyx inferior, 4- 5-toothed, ribbed in most cases. Corolla monopetalous, 4- 5-cleft, regular, imbricated. Stamens alternate with the segments of the corolla, out of which they arise; anthers versatile. Ovary superior, 4- 8-celled, with 1 pendulous, anatropal ovule in each cell; style continuous; stigma 4-8-cleft, with recurved segments. Fruit drupaceous, 4- 8-celled; part of the cells frequently abortive. Seed pendulous from the apex of the cells by a long funiculus, upon which it is turned back; embryo inverted, with the cotyledons plaited longitudinally; albumen 0; radicle superior.

The plaited cotyledons and dichotomous style first led to the separation of this Order from Borageworts, with which it was formerly associated, chiefly, it is to be supposed, on account of the roughness of the leaves. Von Martius remarks, that it is in fact much nearer Bindweeds, from which it differs in its inverted embryo and drupaceous fruit. Nevertheless, M. Alph. De Candolle has reverted to the old opinion, and admitted it as the first tribe of his Borragineæ. I confess, however, that it seems to me impossible to admit Sebestens even into the same category as Borageworts, the indispensable peculiarities of which are a gyrate inflorescence, and nucamentaceous fruit, neither of which circumstances occur here.

The species are, for the most part, natives of the tropics of both hemispheres. A few occur in the cooler parts of South America.

The flesh of their fruit is succulent, mucilaginous, and emollient, as is seen in *Cordia Myxa* and *latifolia*. They are believed to have been the *Persea* of Dioscorides. The smell of their nuts when cut is heavy and disagreeable, the taste of the kernels like that of fresh filberts. They are the true Sebestens of the European *Materia Medica*, but according to Roxburgh, are not used in the Northern Circars of India, for any medicinal purpose. When ripe they are eaten by the natives, and also most greedily by several sorts of birds, being of a sweetish taste. *Cordia Rumphii* has a brown wood, beautifully veined with black, and smelling of musk. The timber of *C. Gerascanthus*, called Bois de Chypre, and Spanish Elm, is of some importance in the West Indies. The bark of

Fig. CCCCXXII.—*Cordia Sebestena*. 1. calyx; 2. pistil; 3. transverse section of embryo.



*C. Myxa* is a mild tonic, and is used in India for various purposes. It is used by females to be laxative. The wood is soft, and of little use except for fuel. It is considered one of the best kinds for strolling fire by Africans, and is used by them for various purposes, from which the Egyptians constructed their incense-burners.

## GENERA.

Gynnon, *A. DC.*  
*Cordia*, *Pom.*  
*Excoecaria*, *Nees*  
*Persea*, *Nees*

*Cordia*, *W. & A.* *P. DC.* *Physocarpus*, *A. DC.*  
*Excoecaria*, *W. & A.* *Myxa*, *DC.*  
*Rhizophora*, *W. & A.* *Varronia*, *W.*  
*Physocarpus*, *A. DC.*

*Excoecaria*, *W. & A.*  
*Myxa*, *DC.*  
*Varronia*, *W.*

NUMBERS. C. 15. H. 5. Sp. 100.

POSITION. ———— *Cordia*, *W. & A.* — *Cordia*, *W. & A.*  
*Excoecaria*, *W. & A.*

The drupes of *Cordia abyssinica* are eaten by the Abyssinians, and by the  
Wangey or Vansey. — *A. Richard.*

The berries of *Varronia ruficalyx* are eaten by the natives of the country.



## ORDER CCXLI. CONVULVULACEÆ.—BINDWEEDS.

*Convolvuli*, Juss. Gen. 133. (1789).—*Convolvulaceæ*, R. Brown, Prodr. 481. (1810); *Lindl. Synops.* 167. (1829); *Choisy in Mem. Soc. Phys. Genève*. (1834); *Alph. DC. Prodr.* 9. 323.

DIAGNOSIS.—*Silanal Exogens*, with 5 free stamens, basal placenta, and leafy doubled up cotyledons.

Herbaceous plants or shrubs, usually twining and milky, smooth, or with a simple pubescence, sometimes erect bushes. Leaves alternate, undivided, or lobed, seldom

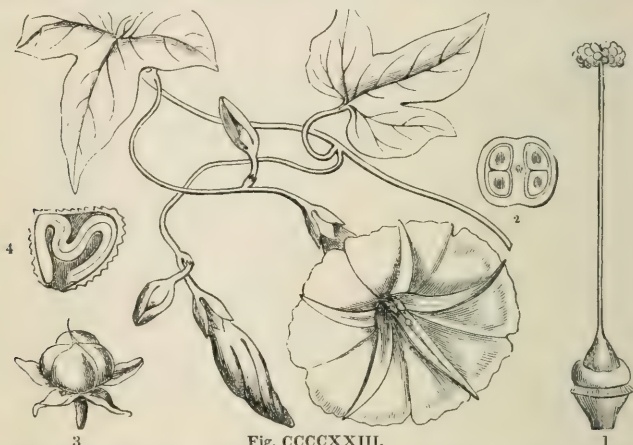


Fig. CCCXXXIII.

pinnatifid, with no stipules. Inflorescence axillary or terminal; peduncles 1- or many-flowered, the partial ones generally with 2 bracts, which sometimes enlarge greatly after flowering. In *Mina* the inflorescence is a one-sided and almost scorpioid raceme. Calyx persistent, in 5 divisions, remarkably imbricated, as if in more whorls than one, often very unequal. Corolla monopetalous, hypogynous, regular, deciduous; the limb 5-lobed, plaited; the tube without scales. Stamens 5, inserted into the base of the corolla, and alternate with its segments. Ovary simple, with 2 or 4 cells, seldom with 1; sometimes in 2 or 4 distinct divisions; few-seeded; the ovules definite and erect, when more than 1 collateral; style 1, usually divided at the top, or as many as the divisions of the ovary, and arising from their base; stigmas obtuse or acute. Disk annular, hypogynous. Capsule with from 1 to 4 cells, succulent or capsular; the valves fitting, at their edges, to the angles of a loose dissepiment, bearing the seeds at its base. Seeds with a small quantity of mucilaginous albumen; embryo curved; cotyledons leafy, shrivelled; radicle inferior, next the hilum.

The plaited corolla, imbricated calyx, and climbing habit, are the *primâ facie* marks of this Order, which approaches *Sebestens* in its shrivelled cotyledons, and through that tribe *Borageworts*. *Mina* here, with its almost scorpioid inflorescence, and *Nolanads* among the *Echials*, would seem to establish even a more direct relationship between *Bindweeds* and that Order. *Phloxworts* are known by their more copious albumen, straight embryo, and loculicidal dehiscence, which in *Bindweeds* is always opposite the dissepiments. *Hydrophylls* are characterised by their parietal placenta, and taper embryo lying in the midst of fleshy albumen. *Night-shades* have a dicarpellary fruit, with axile placenta, and numerous seeds; otherwise, they are sometimes very like the shrubby erect species of *Bindweed*. The Order has been re-arranged by *Choisy* in *De Candolle's Prodromus*, but that author has been sharply criticised by *Bentham* (*London Journal of Botany*, May, 1845, p. 244), and with justice.

Fig. CCCXXXIII.—*Ipomœa Batatoides*. 1. the pistil and annular disk; 2. a transverse section of the ovary; 3. a capsule of *Convolvulus tricolor*; 4. a vertical section of the seed of that species.



Very abundant in all parts of the tropics, but rare in cold climates, where few shells are found; they twice moult after about 40 days among the warm of the tropics. In the coldest climates they are unknown.

In the oldest climates they are unknown. Their roots abound in all arid rocky lands, mostly occasionally poisonous, and depend upon a peculiar virtue, which is the active principle of them; some others whose roots possess almost equalities. Scammony or scammonium root (*Convolvulus Scammoneus*, a Syrian perennial) and a similar one obtained from Ipomoea tricolor, the Spanish Aconite (*Ruellia*), the cathartica, a St. Domingo plant, two Brazilian species called by Martius Gomezil and Pisonis, and others. Of Jalap we have had specimens from Purga, a beautiful twiner with long opposite flowers, but other species also rooted under the same name. Mr. Harvey ascertained that Ipomoea Benthiana of Purga Macho or Male Jalap at Mexico was *Convolvulus Yuccae*, *Solanum elaeagnifolius*, *macranthus*, and probably many others, may be used with great advantage. The root of *Ipomoea pandurata* is employed in the East Indies as food; its operation is like that of Rhubarb; it is supposed to be also diuretic. The roots of *Rhodorhiza florida* and *sagaria*, and *Ipomoea operculata* are said to be purgatives; those of *Batatas edulis* and others are useful articles of food. The common Sweet Potato of European gardens, *Convolvulus batatas*, grows in our soil, and is one of the plants from which the Japan Sugar is prepared. (See Art. 341.) The *Ipomoea sensitiva* of Turpin is remarkable for the facility of its culture. A sort of Jalap having the odor of Hines is described by Tournefort in *Mémoires Voyages*, 3. 331. It is not known from what species of this Order it has been derived. *Ipomoea operculata* yields a purgative drug, imported into Europe under the name Gomma da Batata; and a long list might be made of other species whose purgative qualities have been ascertained. Among these, the following may be particularly mentioned: *Ipomoea pandurata*, or Medlar-root, an American plant; *Ipomoea Knapii*, common in the East Indies, Malayan Archipelago, New Holland, Tonga Islands, Friendly Islands, Marianne Islands, Fatah, &c.; *Convolvulus batatas*, a French Mediterranean plant; and the *Calyceas sepium* and *Salsabilla*, a country. Nevertheless, the purgative *Ipsa* is hardly present in certain species of the genus. It is replaced by starch or sugar; as in *Batatas edulis*, the common Sweet Potato, whose root is an important article of food in tropical countries, but *Batatas* which was formerly called *Ipomoea napotheria*, and notwithstanding the name first quoted, is inert; it is a plant exhibiting the study and of Tournefort's *batatas*, with white insipid farinaceous roots weighing from 40 to 60 lbs., and is assumed by Elliot (Sketch I. 253.), to possess no purgative properties whatever. He assured him that he had administered 6 drachms of the powdered root without effect, and that in fact it contains little or no resin but the *Batatas* roots contain quantities of saccharine and farinaceous matter. Of some two modes of preparing the qualities of the roots. The seeds of the Kadabra or Chacabait (which is very rare here), safe, and pleasant cathartic induces at 20 to 40 grains. In some cases it is emollient. A decoction of the leaves of *Argemone leucostachya* is used in some parts of India as a vomitment in cases of scirrhus enlargements of the stomach, the leaves being employed as a poultice at the same time. And the *Jalap* of *Ipomoea maritima* is employed in Brazil in a similar manner. The spirit of Rhubarb is obtained by distillation an essential oil of a bitter balsamic character, which oil is sometimes they are not, however, according to Mr. Barker Webb, the false Jalap of Demerara which he thinks was certainly *Rhododendron*. The fresh Jalap produced the most recommended to promote sweating, and serves as a gastric tonic if it be used for emulsion, and when burned diffuses a fragrant fragrance. According to the Pharmacopoeia of Oaxaca, the poison called in Mexico Guaco is a *Convolvulus*.

## CONCLUSION

[illegible]



*Lettsomia*, Roxb.  
*Ptyzanthus*, Don.  
*Samudra*, Endl.  
*Blinkworthia*, Chois.  
*Humbertia*, Commers.  
*Thouinia*, Smith.  
*Smithia*, Gmel.

*Endrachium*, Juss.  
*Endrach*, Flacourt.  
*Moorcroftia*, Chois.  
*Maripa*, Aubl.  
*Legendrea*, Webb.  
*Marcellia*, Mart.

II. DICHONDREÆ.—Car-  
 pels distinct.  
*Dichondra*, Forst.  
*Steripha*, Banks et Sol.  
*Demidofia*, Gmel.  
 ? *Hygrocharis*, Hochst.  
*Falkia*, Linn. fil.

Doubtful Genera.

*Mouroucoa*, Aubl.  
*Diplocalymna*, Spreng.  
*Calibrachoa*, Llav.  
 ? *Cervia*, Rodrig.

NUMBERS. GEN. 43. Sp. 660.

*Boraginaceæ.*

POSITION.—*Solanaceæ.*—CONVOLVULACEÆ.—*Polemoniaceæ.*

*Nolanaceæ.*

The *Ipomœa cathartica* is *Pharbitis* c. *The Flore médicale des Antilles* states that M. Bauduit, a rich proprietor of S. Domingo, discovered in this plant a resinous juice, which coagulates and proves to be profusely purgative. He formed of it a much-approved syrup, which in the French colonies bears his name. This syrup is very active, and requires, on account of its drastic properties, to be used with great caution.—*Hooker.*

#### ADDITIONAL GENERA.

*Dicranostyles*, Benth. } near *Maripa*.  
*Lysiostyles*, Id. }  
*Nephrophyllum*, Ach. Rich. } near *Dichondra*.  
*Hygrocrocis*, Hochst. }

*Erycibe*, Roxb.  
*Catonia*, Vell.  
*Erimatalia*, R. & Sch.







Bindweeds, but he admits that under the name of *Cuscuta* are included species with a very variable structure, and which might constitute genera ; and he adds that they might have a claim to be regarded as a peculiar Order if as many as 200 species were known, instead of 50.

These parasites are found in the temperate parts of both hemispheres, twining round the branches of plants and sometimes producing great destruction among crops. They do not appear to occur much in the tropics, where their place is perhaps taken by *Cassyths*. Mr. Griffith speaks of a gigantic species in Affghanistan, which even preys upon itself ; one of its masses half covered a Willow tree 20 or 30 feet high.

Their herbage is acrid, and was formerly used as a purgative. *Cuscuta racemosa* and another or two, called *Sipo de Chumbo*, are articles of Brazilian pharmacy. The juice of the fresh plant is prescribed in sub-inflammatory complaints, hoarseness, and spitting of blood. The powder of the dried plant is strewed on fresh wounds, the healing of which it is said much to promote.

#### GENERA.

*Cuscuta*, *Tourn.*

*Grammica*, *Lour.*

*Lepidanche*, *Engelm.*

NUMBERS. GEN. 2 ? Sp. 50.

POSITION. ————— CUSCUTACEÆ.—Convolvulacæ.  
*Cassythaceæ.*

#### ADDITIONAL GENERA.

*Epilinella*, *Pfeiffer*, in *Ann. Sc.*, 3 *Ser.*, V. 84.

*Engelmannia*, *do.*



Oxide CCXLIII. POLEMONIAC E. — *Polemoniaceae*.

Piedmonte, *Jour. de l'ag.* 1782, p. 101 and *Ibid.*, pp. 219 et 220. — *Piedmonte*, *Ann.*  
Société 168 (1826). *Recherches sur l'ag.* 1826, p. 101. — *Ann.* 1826, p. 101.  
*Jour.* 8, 302. — *Chamisso, Voy. en l'Inde*, *Pl. de l'Inde*, p. 114 (1826). — *Ann.* 1826, p. 101.

DIAGNOSIS. *Schistal Pigeon*, with 5 feet of *Alouatta*, *Alouatta*, and *Alouatta*.

Herbaceous plants, with opposite, or commonly alternate, leaves; stem occasionally climbing. Calyx inferior, generally persistent, sometimes irregular. Corolla regular, or nearly so, 5-lobed. Stamens 5, inserted into the middle of the tube of the corolla, and alternate with its segments. Ovary superior, 3-celled, with few or many anatropal or amphitropal ovules; style simple; stigma trifid. Capsule 3-celled, 3-valved, few or many-seeded, with a loculicidal or septicidal dehiscence; the valves separating from the axis. Seeds angular or oval, or winged, often enveloped in mucus, in which spiral threads are entangled, ascending; embryo straight, in the axis of much horny albumen; radicle inferior, very short; cotyledons elliptical, foliaceous.

The tertiary division of the ovary connects it with the pentandrous corolla and 5-lobed calyx, bring this Order near Bindweeds, from which the habit, embryo, and corolla, distinguish it, but *Colea* has the habit of a Bindweed without the leaves ; from *Gentianworts*, to which it also approaches, the 3-celled ovary divides it. To *Hydrophylls* it approaches very nearly, but the placentation is different ; and therefore, *Phloxworts* are not placed in the *Cortusid* Alliance, but on the borders of it, to which the large embryo also persuades us. It is remarkable how the large embryo of pollen, which is usually of that line, whatever may be the nature of the seed, in *Columba linearis* I have noticed (in *Revue de l'Europe*), and that the mucous matter in which the seeds are enveloped, and which, after they are thrown into water, forms around them like a cloth, depends upon the presence of a cellular multitude of exceedingly delicate and minute spiral vessels, being covered by a spirule, on the outside of the testa ; when dry, these vessels are closed, and prevent the seed by its mucus, without being able to transmit plasmic matter, and when water is applied, the mucus dissolves and ceases to enclose the seed, and the spiral threads, which then dart forward at right angles with the testa, each bearing with it a sheath of mucus, in which it for a long time remains enveloped, as if in a mud-like case. This singular phenomenon appears to be the property of the *Mucosae*. Among one of the plants referred to an imaginary Order, *Empoynas*, we have a singular case to which indeed it might have been referred if its silva were not composed of dissimilar imbedded sepals. Is it really so ?

Mr. Bentham observes that *Phlox* was first perhaps introduced among the maceworts and Nightshades. They are, however, distinguished from the former by the constancy (unless in accidentally abnormal specimens) of the corolla-tube, and by the contorted aestivation of the petals and sepals, and by the trifoliate aestivation of Nightshades and Figworts, with the trifoliate aestivation of the petals and sepals in the two latter Orders. — *Linnaeus, Systema Naturae*, 1760, p. 103, observes that the tricarpellary structure of the ovary (not the anthers) characterizes all *Asclepi-*



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Fig. CCCCXXVI.—*Collosum gracile*. 1, only a few caudate; 2, better; 3, head narrow; 4, eye and



ance of which either Borageworts, Gentianworts, Dogbanes, or Figworts form a part, and that in reality its most immediate affinities are with Bindweeds on the one hand, and Hydrophyls on the other.

Very abundant in both North and South America, in temperate latitudes, particularly on the north-west side. It is stated by Richardson, that the most northern limit in North America is 54°.—*Edin. Phil. Journ.* 12. 209. In Europe and Asia they are much more uncommon. They are unknown in tropical countries.

The Greek Valerian, *Polemonium cæruleum*, is a mucilaginous, nauseously bitter plant. In Siberia, poultices are prepared from its leaves, and thought serviceable in syphilitic sores. The Russians fancy that a decoction of it is useful in hydrophobia.

#### GENERA.

<i>Caldasia</i> , Willd.	<i>Welwitschia</i> , Reichenb.	<i>Dactylophyllum</i> , Benth.	<i>Læselia</i> , Linn.
<i>Bonplandia</i> , Cav.	<i>Curtoisia</i> , Rehb.	<i>Ipomopsis</i> , L. C. Rich.	<i>Royena</i> , Houst.
<i>Phlox</i> , Linn.	<i>Linanthus</i> , Benth.	<i>Ipomeria</i> , Nutt.	<i>Schizocodon</i> , Zucc.
? <i>Dupratia</i> , Raf.	<i>Leptosiphon</i> , Benth.	<i>Brickelia</i> , Raf.	<i>Cantua</i> , Juss.
<i>Collomia</i> , Nutt.	<i>Leptodactylon</i> , Hook.	<i>Navarretia</i> , Ruiz et Pav.	<i>Periphragmos</i> , R. et P.
<i>Gilia</i> , Ruiz et Pav.	<i>Dianthoides</i> , Endl.	<i>Ægocloa</i> , Benth.	? <i>Bronnia</i> , H. B. K.
<i>Collomoides</i> , Endl.	<i>Fenzlia</i> , Benth.	<i>Polemonium</i> , Tournef.	<i>Cobæa</i> , Cav.
<i>Hugelia</i> , Benth.	<i>Rossmæstlera</i> , Rehb.	<i>Hoitzia</i> , Juss.	? <i>Cyananthus</i> , Wall.

NUMBERS. GEN. 17. Sp. 104.

#### *Hydrophyllaceæ.*

POSITION.—*Convolvulaceæ*.—POLEMONIACEÆ.—*Solanaceæ*.  
*Gentianaceæ*.

Dr. Asa Gray, who has examined complete specimens of *Bronnia*, regards it as being the same genus as *Fouquiera*, and stations it near *Crassulaceæ*.



## ALLIANCE XLVII. CORTUSALES.—THE CORTUSACEÆ ALLIANCE.

DIAGNOSIS.—*Perogyne flagens*, with somewhat rounded glumes, a few pointed granules, and an embryo lying among a large quantity of albumen.

The Cortusal Alliance is distinctly limited among *Perogyne flagens* by its non-central placenta, and an embryo lying in the middle of the albumen. By this last circumstance it is separated from the Ficoidal Alliance, which has had a few central placenta. There is thus other essential difference, and the location of the ovule is towards a polypetalous or apetalous structure, while that of Cortusals is towards a monopetalous condition. In general, moreover, the albumen of the latter is extremely abundant and hard; but Leadworts have it insignificant in quantity and taste, in which latter respect they correspond with Ficoidals.

In a collateral way these plants may be brought in contact with Scrophulariaceæ through Primworts, with Sapeteals and Labiales through Asclepiads, and with Cruciferales through Hydrophylls, which last offer the best transition to the Ficoidal Alliance.

In Ribworts the placentation is less obviously central than in the other Cortusals, but really is so, as is shown in speaking of these plants. In fact, the placentation of Ribworts and Ribworts is of quite the same nature.

## NATURAL ORDERS OF CORTUSAL.

Stems alternate with the petals. Style 2. <i>Lupinus</i> (L.)	} ALL HYMENOPHYTES.
Stems . . . . .	
Stems opposite the petals. Fruit indehiscent, rounded.	} ALL EUCORYMBES.
Style 3. Stem herbaceous . . . . .	
Stems alternate with the petals. Style 1. <i>Lupinus</i> (L.)	} ALL EUCORYMBES.
Stems opposite the petals. Fruit capsular, elongated.	
Style 1. Stem herbaceous . . . . .	} ALL EUCORYMBES.
Stems opposite the petals. Fruit capsular, elongated.	
Style 1. Stem woody . . . . .	} ALL EUCORYMBES.
Stems opposite the petals. Fruit capsular, elongated.	



## ORDER CCXLIV. HYDROPHYLLACEÆ.—HYDROPHYLS.

*R. Brown. Prodr.* 1. 492. (1810), *without a name*.—Hydrophyllæe, *Von Martius N. G. et Sp.* 2. 138. (1828); *Bentham in Linn Trans.* 17. 267. (1834); *Endl. Gen.* cxlvi.; *Alph. DC. Prodr.* 9. 287.—Hydroleaceæ, *R. Brown Prodr.* 482. (1810), *without a name*; *Id. in Congo, Kunth in Humb. N. G. et Sp.* 3. 125. (1818); *Barth. Ord. Nat.* 189; *Choisy Deser. des Hydroleacees (no date)*; *Endl. Gen.* cxlvii.; *Meisner Gen.* p. 272; *A. DC. Prodr.* 564. Note; *Ed. pr. No.* cxxviii.

DIAGNOSIS.—*Cortusal Ecogens, with the stamens alternate with the sepals, 2 styles, and a circinate inflorescence.*

Small trees, bushes, or herbaceous plants, often hispid. Leaves often lobed, alternate, or the lower ones opposite. Flowers arranged in gyrate racemes or unilateral spikes, or occasionally solitary and stalked in the axils of the leaves. Calyx inferior, persistent, deeply 5-cleft; the recesses usually augmented with reflexed appendages. Corolla monopetalous, hypogynous, regular, shortly 5-cleft, between campanulate and rotate, rarely funnel-shaped. Stamens 5, epipetalous, alternate with the segments of the corolla, inflected in æstivation; anthers versatile, 2-celled, the cells parallel, dehiscing longitudinally.

Ovary superior, simple, 1- 2-celled; styles 2, long; stigmas 2, terminal; placenta 2, free at their back or united to the shell of the ovary, with two or many amphitropal ovules on their inner face. Fruit capsular, 2-valved, sometimes 1-celled, with a large placenta filling the capsule, sometimes somewhat 2-celled, with the dissepiments incomplete. Seeds reticulated; albumen abundant, cartilaginous; embryo conical, with its radicle next the hilum.

The general aspect of these plants is that of Borageworts, which agree in the roughness of their leaves and in their peculiar gyrate, circinate or scorpioid inflorescence. They are, however, known by their undivided 1-celled ovary, terminal style or styles, and ovules (if definite) attached to two stalked fungous placentæ, which arise from the base of the cell, having their ovules on their inner face, or (if indefinite) attached to parietal placentæ. They are further characterised by the presence, in many species, at the base of each lobe of the corolla, of 2 scales or lamellæ, the nature of which is unknown. In general appearance they are also sometimes similar to Polemoniaceæ (Phloxworts). But the large quantity of albumen, the indefinite seeds, the central fungous placentæ, are all circumstances that point to Primworts, with which it seems necessary to associate them; for the minute embryo of all the genera associated with Hydrophyls, and their hard cartilaginous albumen, forbid their being regarded as more than analogous to either Phloxworts or Borageworts. For many years it has been customary to consider these plants distinct from Hydroleaceæ, but I quite agree with M. Alph. De Candolle that there are very slight differences between them. Indeed, upon comparing the distinctions hitherto relied upon, they really amount to this and no more: that in Hydrophyls the ovary is 1-celled, and in Hydroleaceæ 2-celled; but in all cases among these plants the placentæ are a pair of fungous projections from the margin or base of the ovary, and it is their adhesion in various ways that determines whether the cavity has 1 or 2 cells. In the former edition I pointed out the near affinity of the two supposed Orders, and I now unite them, not seeing how even sectional characters can be found for them.

Trees or herbaceous plants, found either in the north or among the most southern of the southern provinces of America; not much known beyond that continent. Nama

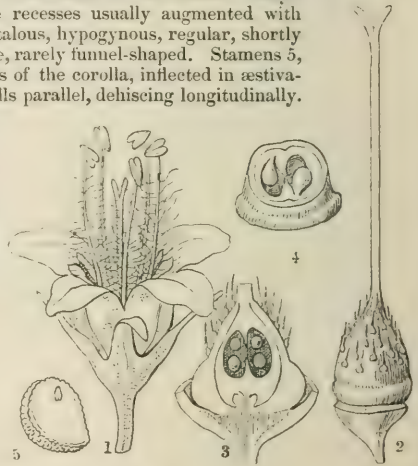


Fig. CCCCXXVII.

Fig. CCCCXXVII.—Hydrophyllum canadense. 1. a flower; 2. a pistil; 3. a perpendicular section of the ovary; 4. a cross section. 5. Section of seed of *H. virginianum*.—Gærtner.







## ORDER CCXLV. PLUMBAGINACEÆ.—LEADWORTS.

Plumbagines, *Juss. Gen.* 92. (1789).—Plumbaginæ, *R. Brown, Prodr.* 425. (1810); *Ebel de Armeria Gen. Prodr.*; *Endl. Gen.* cxvii.; *Meisner Gen.* p. 315; *Barnéoud Mémoire, sur les Plumbaginées.*

DIAGNOSIS.—*Cortusal Exogens*, with the stamens opposite the petals, membranous one-seeded fruit, 5 styles, and a herbaceous stem.

Herbaceous plants or under-shrubs, variable in appearance. Leaves alternate or clustered, undivided, somewhat sheathing at the base, but without stipules, sometimes marked with transparent dots. Flowers either loosely paniced, or contracted into heads, flowering irregularly. Calyx tubular, plaited, persistent, sometimes coloured. Corolla of very thin texture, monopetalous, with a narrow angular tube, or of 5 petals, which have a long narrow claw. Stamens definite, opposite the petals, in the monopetalous species hypogynous! in the polypetalous arising from the petals! ovary superior, composed of 5 (or 3 or 4) valvate carpels, 1-celled, 1-seeded; ovule anatropal, pendulous from the point of an umbilical cord, arising from the bottom of the cavity; styles 5! seldom 3 or 4; stigmas the same number. Fruit a nearly indehiscent utricle. Seed inverted, with a rather small quantity of mealy albumen; testa simple; embryo straight; radicle superior.

Distinguished from all monopetalous Orders by their plaited calyx and solitary ovule, suspended from the apex of a cord which arises from the base of a 1-celled ovary, with several stigmas. They are nearly related to Primworts, in their habit, if *Armeria* is compared with *Androsace*, and as is indicated by the opposition of the stamens to the lobes of the corolla; but they have less albumen and a larger embryo than properly belongs to the *Cortusal Alliance*, of which they must be looked upon as one of the most outlying Orders. The economy of the ovule is highly curious; before fecundation it is suspended from the apex of a cord, or rather strap, which

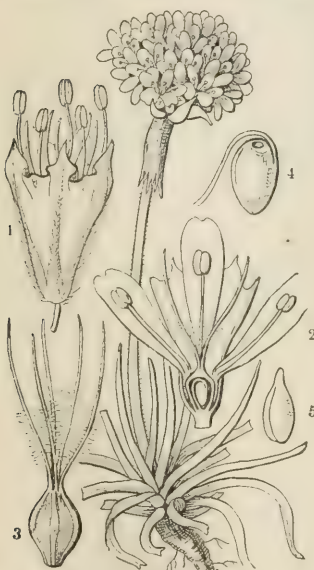


Fig. CCCXXVIII.

lies over the foramen or orifice through which the vivifying influence of the pollen has to be introduced; this foramen is presented to the summit of the cell immediately below the origin of the stigmas, but has no communication with that part of the cell, from contact with which it is further cut off by the overlying strap; but as soon as the pollen exercises its influence upon the stigmas, the strap slips aside from above the foramen, which is entered by an extension of the apex of the cell, and thus a direct communication is established between the pollen and the inside of the ovule. This phenomenon is obscurely hinted at by several writers, but was first distinctly shown me by Dr. Brown, and has since been beautifully illustrated by Mirbel, *Nouvelles Recherches sur l'Ovule*, tab. 4. According to Koch, the singular sheath which in *Armeria* invests the top of the scape, and which Ray supposed to be of the nature of a calyptra, is nothing more than the base of the involucreal leaves, in a state of adhesion.

Many are inhabitants of the salt marshes and sea-coasts of the temperate parts of the world, particularly of the basin of the Mediterranean, the southern provinces of the Russian empire, and especially of Afghanistan. The *Koollah-i-Huzareh*, which forms a large part of the fuel of Cabul, consists of various species of *Statice*. Others grow from Greenland and the mountains of Europe, to the sterile volcanic regions of Cape Horn. A few are found within the tropics; of these *Plumbago zeylanica* extends from Ceylon to Port Jackson, and *Ægialitis* grows among the Mangroves of northern Australasia. *Vogelia* is from the Cape of Good Hope, and *Ceratostigma* from China.

Fig. CCCXXVIII.—*Armeria vulgaris*. 1. calyx and stamens; 2. section of corolla; 3. pistil; 4. ovule; 5. embryo.



The Order contains plants of very different qualities; some are bitter, and purgative, and part acid and emetic in the highest degree. The root of *Plumbago capensis* is one of the most powerful emetics in the vegetable medicine. The leaves have bark of the root of *Plumbago capensis* acts as a vomitive, and is applied in India to induce in their incipient state. *Plumbago capensis* is employed by surgeons to cure ulcers upon their bodies to excite pity. Its root is used that it is used to induce for causing issues, and even as a violent. — *Ann. Ch. 1. 248.* But Boerhaave de la Caille says that a young woman, who had 3 applied, alleged that the pain it occasioned was intolerable, and that she felt as if being staked alive. Advancement commonly is made, does it is said to be as effective as emetic as *Ipecacuanha*. It is used by Physicians, have been used with considerable advantage in many of them, for the skin, because the ulcers were dressed twice daily with ointment in which the leaves had been infused. *Plumbago scandens* is called *Herbe du Diable* in St. Domingo. Its root is said by Martius to be the most active part, and to be almost emetic in the highest degree. It is applied in pains of the ears, and a decoction is sometimes in the public education. *Plumbago rosea* is usually believed to be the *Rosa vesicatoria* of Boerhaave, which being sliced and applied to the skin produces blisters, but less rapidly and efficiently than *Cantharides*. *Artemisia vulgaris* is regarded in Germany as an active emetic. From two drachms to an ounce of the flowers freely infused and quickly dried should be gently boiled and the patient allowed to drink it at the discretion of the physician. Some aromatic, as Anise or Cinnamon, is added to the decoction. The roots are used, and the excretion of urine in a direct manner. — *Mat. Med. 22. 111.* As garden plants, nearly the whole Order is much prized for beauty, particularly the *Statice*, many of which are among the most lovely herbaceous plants we know.

The following appears in *Dr. Cassin's Preface*, XII. p. 111. as the commonment of the

GENERA

STATICE.	Genes (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.
Statice (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.
Statice (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.
Statice (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.
Statice (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.	Statice (Drum.) Root.

NUMBERS. Genes. 111. Statice.

POSITION. — Primulacere. — Primulacere. — Primulacere.



## ORDER CCXLVI. PLANTAGINACEÆ.—RIBWORTS.

Plantagines, *Juss. Gen.* 89. (1789).—Plantaginæ, *R. Brown Prodr.* 423. (1810); *Endl. Gen.* cxvi.; *Meisner, p.* 315; *Leydolt, die Plantagineen*; *Barnéoud Recherches sur le Développement, &c., des Plantaginées.*

DIAGNOSIS.—*Cortusal Exogens*, with stamens alternate with the petals, 1 style, and a straight inflorescence.

Herbaceous plants, usually stemless, occasionally with a stem. Leaves forming rosettes, or in the caulescent species both alternate and opposite; flat and ribbed or taper and fleshy. Flowers in spikes, rarely solitary, usually ♂, seldom by abortion ♀.

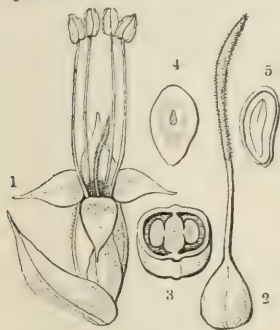


Fig. CCCXXIX.

This is a group regarding whose affinities the opinions of Botanists are unsettled. By Jussieu it was considered apetalous, and placed near Amarantths and Chenopods, the calyx being called bracts, and the corolla calyx; but this is scarcely an admissible explanation of the structure. I formerly stationed it near Leadworts, to which it must be regarded as nearly allied; but I was certainly wrong in associating it with composite plants and their allies. Don was, I think, the first to suggest that it might be connected with Primworts by means of Glaux, an apetalous genus belonging to that Order. Latterly M. Barnéoud, who has particularly studied the subject, has suggested that the supposed corolla is nothing more than a series of abortive stamens analogous to the membranous cup of Gomphrenas and other Amarantths; and he adopts the opinion of Jussieu that the Orders of Amarantths and Chenopods are those with which Ribworts ought to be associated. In this opinion I cannot concur. There is nothing to distinguish the corolla of Ribworts from the part so called in other plants, except its thinness and want of vascular texture; all corollas must, in a morphological sense, be regarded as barren stamens; and, moreover, the embryo and seed of Ribworts are totally different from anything known in the Chenopodal Alliance. It appears to me that Don's idea was correct, and that upon the whole the Order is a near ally of the Primworts.

The ovary of *Plantago* does not present distinctly the appearance of a free central placenta. But in reality the placenta is at first quite free, although eventually it is pressed close to the sides of the ovary, and thus divides the cavity into 2 or more cells. This is, however, only a temporary contact, for long before the seeds are ripe the placenta shrinks so much as to lose its adhesion with the sides of the ovary, and then it becomes truly free. In *Plantago arborescens* it is, when ripe, continuous with the stigma, and the two become loose and may be removed together, leaving the sides of the ovary undisturbed.

The tendency to diclinism is very striking in the genus *Littorella*, and also occurs in *Bougueria*; it is not, however, perfect, for the male *Littorellas* have the rudiment of an ovary.

The species are scattered over the whole world, in almost every quarter of which

Fig. CCCXXIX.—*Plantago lanceolata*. 1. flower and bract; 2. pistil; 3. ovary cut across; 4. seed; 5. section of it.



they are found in one situation or another. They are chiefly common in cool or temperate latitudes.

Their herbage is slightly bitter and astringent, and their seeds are mucilaginous and febrifuges. Their seeds are covered with cortex. According to De Cussette, *Plantago arenaria* are exported in considerable quantities from Tunis and Morocco to the north of Europe, and are supposed to be consumed in the manufacture of muslins. The seeds of *Plantago Josephsoniana* is a very mucous nature, and, like those of *Plantago Psyllium*, form, with boiling water, a rich mucilage, which is much used in India in catarrh, paracanth, and ophthalmia affections. The seeds of *P. Psyllium*, *arenaria*, and *Cynopo*, have been found with medicinal virtues as a good substitute for Flaxseed or Madderseed. *P. Cynopo*, formerly thought an antidote to hydrophobia, is said to be a diuretic. Soda is added to Egyptian loaves, ashes of *P. squarrosa*.

#### GENERA.

<i>Littoralla</i> , L.	<i>Epipactis</i> , Persoon
<i>Bombarda</i> , Persoon	<i>Plantago</i> , Persoon
<i>Plantago</i> , L.	<i>Plantago</i> , L.

#### NUMERUS GEN. 3. SPECIES.

POSITION.—*Plantaginaceæ*.—*PLANTAGINACEÆ*.—*Plantaginaceæ*.—*Plantaginaceæ*.



## ORDER CCXLVII. PRIMULACEÆ.—PRIMWORTS.

*Lysimachia*, *Juss. Gen.* 95. (1789).—*Primulaceæ*, *Vent. Tabl.* 2. 285. (1799); *R. Brown Prodr.* 427; *A. de St. Hilaire, Ann. Sc. Nat. n. s. v. 30. xi. 85.*; *Endl. Gen.* clvi.; *Meisner Gen.* p. 254; *DC. Prodr.* 8. 33; *Duby in Mém. Soc. Phys. Genève.* 10. 395.—*Anagallidæ*, *Baudo in Ann. Sc. Nat. n. s. xx. 344.* (1843).

DIAGNOSIS.—*Cortusal Exogens*, with stamens opposite the petals, a capsular many-seeded fruit, 1 style, and a herbaceous stem.

Annual or perennial herbaceous plants, sometimes almost shrubby. Leaves usually radical; otherwise both whorled and opposite or alternate. Stipules 0. Flowers either on radical scapes and in umbels, or variously arranged in the axils of the leaves. Calyx

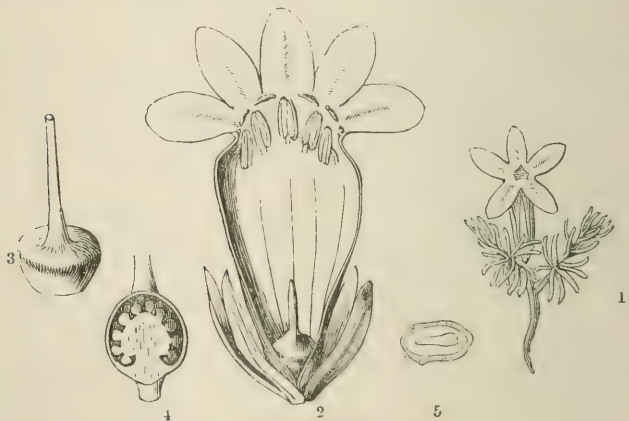


Fig. CCCCXXX.

5-cleft, seldom 4-cleft, inferior, or half superior, regular, persistent. Corolla monopetalous, hypogynous, regular; the limb 5-cleft, seldom 4-cleft; very rarely 0. Stamens inserted upon the corolla, equal in number to its segments, and opposite them. Ovary 1-celled; style 1; stigma capitate; ovules usually amphitropal, rarely anatropal. Capsule opening with valves; placenta central, distinct. Seeds numerous, peltate; embryo included within fleshy albumen, and lying across the hilum; radicle with no determinate direction.

The monopetalous corolla having the stamens opposite its lobes, the composite nature of the ovary, whose placenta is free and central, and the position of the embryo across the hilum, afford ample means for recognising the Order of Primworts, unless they are compared with Ardisiads; from which it is so impossible to distinguish them by any very good character, that Mr. Bentham has proposed to unite the two Orders, adding that, in fact, *Primula* and *Myrsine* are not more different than *Viola* and *Alsodeia*. Nevertheless, all systematic authors distinguish them, chiefly, as it seems, because no good transition can be found from the herbaceous growth of Primworts to the arborescent or woody structure of Ardisiads. Dunal, one of the later writers on the subject, says that Primworts are, 1, capsular; 2, have seeds placed on the surface of the placenta; 3, are herbs; and 4, are uniformly ♂; while on the other hand Ardisiads are, 1, drupaceous; 2, have seeds sunk in sockets of the placenta; 3, are woody; and 4, are very frequently polygamous; and these are doubtless the best distinctions that can be found. But a somewhat succulent fruit occurs in *Lubinia*, and a partially alveolate placenta in



Fig. CCCCXXXI.

Fig. CCCCXXX.—1. *Aretia Vitaliana*; 2. a flower cut open; 3. the pistil; 4. a vertical section of the latter, showing the free central placenta; 5. a section of a seed.

Fig. CCCCXXXI.—Section of half-ripe fruit of *Anagallis arvensis*.



*Coris* and *Amagallis*, all genera of *Primulaceæ*, in that not botanically distinguished, because he absolutely relied upon. I think, however, that the two Orders really are different, and that *Coris* and *Lalondea* are but the usual instances of loss of character, such as are to be traced in almost all Natural Orders. M. Duby also points out a resemblance to *Purshianthus*, found in a supposed genus of that Order called *Cypripedium*; but that plant is certainly no *Purshianthus*, but, in line of separation, and the resemblance traced between it and *Primulaceæ*, is very indistinct. The collateral affinities of *Primulaceæ* are much greater with *Nightshades* and *Diapensiaceæ*, in both which they are similar in habit.

Many cases of anomalous structure occur among these plants. *Samolus* is remarkable for having an inferior ovary, and barbed stamens alternating with the lobes of the corolla. Similar stamens are present in *Lysimachia ciliata*, *hybrida*, and others. *Apochoris* and *Pelletiera* have the petals distinct, and they are hardly united in even *Asterolobus* and *Neocollinsia*. *Glaux* is remarkable for being absolutely apetalous. A frequent peculiarity among the genera is to have that kind of fruit which Botanists call a *Tyxis*.

Common in the northern and colder parts of the globe, growing in marshes, hedges, and groves, by mountains and rivulets, and even among the snow of elevated rugged mountains. The genus *Douglasia* was named by the traveller whose name it bears, blossoming while covered with snow, on the Rocky Mountains of America. *Primulaceæ* are uncommon within the tropics, where they usually occupy either the sea shore or the summits of the most lofty hills. The genus *Samolus* is common in New Holland.

As beautiful objects of culture, these rank among those which are most highly prized, both on account of their bright but modest looking flowers, the earliest blossoming period of spring, and also for the sake of their fragrance. Some of them have powerful active principles. The flowers of the Cowslip, *Primula veris*, possess well marked sedative and diaphoretic properties, and make a pleasant reparative tonic. The leafy root has a small resembling Anise, and was formerly employed as a tonic, increased, and also as a diuretic. The leaves of *Primula Amurensis* are used in the Alps as a remedy for coughs. *Soldanellas* are slightly purgative. *Sedum Vaccinifolium* is bitter. *Veronica* are called Sowbreads, because they are the favourite food of the wild hares of Europe; yet they are very acrid plants, especially the first, whose acrimony is not easily perceived at the first tasting, but soon becomes intolerably so. It has been used medicinally, its action being that of a drastic purgative, and sometimes it was even esteemed as an emmenagogue; but whether its reputation was owing to its laxative powers or to its placental root is doubtful. Sibthorp says that the natives of Corsica use the bruised root of *Cyclamen persicum* as a means of driving the *Scylla* out of its holes. It is said that these roots, notwithstanding their acrimony, are innocuous when dried or roasted. *Amagallis* appears and operates like *Veronica* of the French, have had some reputation in cases of madness. The system of general energetic powers, for Orfila destroyed a dog by making a decoction of the extract; it was found to have inflamed the mucous membrane of the stomach. A similar result was obtained by Goussier. It has been proved to produce cholera and drowsy. *Coris monspeliensis* was employed in the medicine of the Greeks, in several orders as a most efficacious vulnerary, when dried and reduced to powder. *Bot. Grec.* vii. 536. It has also been prescribed in *Scrophulous* cases.

# GENERA.

I. PRIMULIDÆ.	II. PRIMULIDÆ.	III. PRIMULIDÆ.	IV. PRIMULIDÆ.
<i>Douglasia</i> , L. B.	<i>Primula</i> , Linn.	<i>Pellaea</i> , L. B.	<i>Lysimachia</i> , Benth.
<i>Androsace</i> , Tournef.	<i>Androsace</i> , Endl.	<i>Androsace</i> , L. B.	<i>Androsace</i> , L. B.
<i>Veronica</i> , Linn.	<i>Veronica</i> , Endl.	<i>Veronica</i> , L. B.	<i>Veronica</i> , L. B.
<i>Veronica</i> , Duby	<i>Veronica</i> , Linn.	<i>Veronica</i> , L. B.	<i>Veronica</i> , L. B.
<i>Maerophyllum</i> , Duby.	<i>Maerophyllum</i> , Linn.	<i>Maerophyllum</i> , L. B.	<i>Maerophyllum</i> , L. B.
<i>Gregoria</i> , Duby.	<i>Gregoria</i> , Linn.	<i>Gregoria</i> , L. B.	<i>Gregoria</i> , L. B.
<i>Pelletiera</i> , Gaudin.	<i>Pelletiera</i> , Linn.	<i>Pelletiera</i> , L. B.	<i>Pelletiera</i> , L. B.
<i>Pelletiera</i> , Sussl.	<i>Pelletiera</i> , Linn.	<i>Pelletiera</i> , L. B.	<i>Pelletiera</i> , L. B.
<i>Dionysia</i> , Fench.	<i>Dionysia</i> , Linn.	<i>Dionysia</i> , L. B.	<i>Dionysia</i> , L. B.

Fig. CCCCXXXII.—Stem of *Primula*, a natural flower.

Fig. CCCCXXXIII.—Fruit of *Primula*.



Coris, *Tournef.**Jirasekia*, Schm.  
*Stenogyra*, Baudo.  
*Micropyxis*, *Duby.**Stratiotes*, *Vaill.**Samodia*, *Baudo.*

## II. ANAGALLIDÆ.

*Centunculus*, *Linn.*  
*Anagallis*, *Tournef.*  
*Euparea*, *Banks.*III. HOTTONIDÆ.  
*Hottonia*, *Linn.*

## IV. SAMOLIDÆ.

*Samolus*, *Tournef.*  
*Sheffieldia*, *Forst.*Little known Genera.  
*Manælia*, *Bowd.*  
*Findlaya*, *Bowd.*

NUMBERS. GEN. 29. Sp. 215.

*Solanaceæ.*POSITION.—*Myrsinaceæ.*—PRIMULACEÆ.—*Plumbaginaceæ.**Diapensiaceæ.*

*Lysimachia thyrsiflora* produces on its petals the brown linear cysts of an *Ardisiad*.

The affinity between Primworts and Leadworts is strikingly confirmed by the *Armerine* Primroses, which have their involucral leaves extended downwards into a sheath, as in the genus *Armeria*.

## ADDITIONAL GENERA.

*Oscaria*, *Lilja*, = *Primula*.*Cankrienia*, *de Vriese.*Fig. CCCCXXXIII. *bis.*Fig. CCCCXXXIII. *bis.*—*Primula involucrata*.







globe. I have alluded to the *Suttonia divaricata* having a considerable range in latitude, a circumstance not without parallel in the Order to which it belongs. Of this, *Myrsine africana* is an extreme instance, that plant being found both at the Cape of Good Hope, in Abyssinia, and in the Azores. The species of the Natural Order are, however, as M. A. De Candolle well remarks (*Linn. Trans.* vol. xvii. p. 99), very confined as regards their geographical limits, Melastomaceæ and Myrtaceæ being two of the very few groups containing about the same or a greater number of species which are more so."—*Jos. Hooker, Bot. of Antarctic Voyage*, p. 52.

Their properties are little known. Many are handsome shrubs, with fine evergreen leaves. Bread is said to be prepared from the pounded seeds of *Theophrasta Jussiei* in St. Domingo, where it is called *Le Petit Coco*. A slight degree of pungency exists in the berries of *Embelia Ribes*, and some others; cathartic properties are ascribed to those of *E. robusta* and *Myrsine bifaria*. The bark of *Cybianthus detergens* is both gummy and astringent, and is used in baths and as a lotion by the Brazilians, against impetiginous affections. The seeds of *Wallenia laurifolia* are peppery. According to Mr. Griffith, the fruit of the *Reptonia* (*Edgeworthia*) *buxifolia*, or *Goorgoor*, is commonly sold in the bazaars of Cabul. It is roundish and succulent, about the size of a marble, and is considered heating by the Affghans.—*Ann. Nat. Hist.* x. 193. The leaves and branches of some *Jacquinias* are said to be poisonous to fish, as is their fruit to man; but this statement requires confirmation. The fruit of *Clavija* is pleasant to eat; the root emetic. Many have resinous cysts in their wood, fruit, and flowers.

#### GENERA.

I. MÆSEÆ.  
*Mæsa*, Forsk.  
*Bæobotrys*, Forst.  
*Sibouratia*, Thouars.

II. EMBELIÆ.  
*Embelia*, Juss.  
*Ribesiodes*, Linn.  
*Ribes*, Bunn.  
*Choripetalum*, A. DC.  
? *Othra*, Thunb.  
? *Orixa*, Thunb.

III. ARDISIÆ.  
*Oncostemum*, Adr. Juss.  
*Amblyanthus*, A. DC.  
*Hymenandra*, A. DC.

*Antistrophe*, A. DC.  
*Pleiomeris*, A. DC.  
*Heberdenia*, Banks.  
*Pimelandra*, A. DC.  
*Myrsine*, Linn.  
*Plotia*, Adans.  
*Rapanea*, Aubl.  
*Mangilla*, Juss.  
*Caballeria*, R. P.  
*Samara*, Swartz.  
*Scleroxylon*, Willd.  
*Athruphyllum*, Lour.  
*Husta*, Fl. Flum.  
*Peckia*, Fl. Flum.  
*Zacyntha*, Fl. Flum.  
*Suttonia*, A. Rich.  
*Labisia*, Lindl.  
*Badula*, Juss.  
*Barthesia*, Comm.

*Cephalogyne*, A. DC.  
*Discocalyx*, A. DC.  
*Isostylis*, A. DC.  
*Acephala*, A. DC.  
*Hemigyne*, A. DC.  
*Astrophe*, A. DC.  
*Stylogyne*, A. DC.  
*Monoporus*, A. DC.  
*Wallenia*, Swartz.  
*Petesiodes*, Jacq.  
*Conomorpha*, A. DC.  
*Conostylus*, Pohl.  
*Weigeltia*, A. DC.  
*Cybianthus*, Mart.  
*Icacorea*, Aubl.  
*Ardisia*, Swartz.  
*Pyrpus*, Lour.  
*Niara*, Dennst.  
*Bladhia*, Thunb.

*Micranthera*, A. DC.  
*Tyrbæa*, A. DC.  
*Pickeringia*, Nutt.  
? *Purkingia*, Presl.

IV. THEOPHRASTEÆ.  
*Jacquinia*, Linn.  
*Bonellia*, Berter.  
*Theophrasta*, Juss.  
*Clavija*, Ruiz et Pav.  
*Theophrasta*, Linn.  
*Eresia*, Plum.  
? *Oncinus*, Lour.  
*Monotheca*, A. DC.  
*Reptonia*, A. DC.  
*Edgeworthia*, Falc.

NUMBERS. GEN. 30. Sp. 320.

*Sapotaceæ.*

POSITION.—Primulaceæ.—MYRSINACEÆ.—  
*Ebenaceæ.*

The Abyssinians mix the fruit of *Myrsine africana* with barley, as food for their asses and mules. They regard that of *Mæsa lanceolata* as a vermifuge.—*A. Richard.*

#### ADDITIONAL GENERA.

*Climacandra*, Miquel.  
*Samara*, L. = *Choripetalum*, Alph. DC.

*Grammadenia*, Benth. near *Cybianthus*.

*ÆGICERACEÆ*, Blume in *Ann. Sc. Nat. n. s.* 2. 97. *Alph. De Cand. Prodr.* 8. 141. Under this name is included the genus *Ægiceras* of Gærtner, a group of shore plants inhabiting the tropics, and rooting out of their seed-vessels into the mud, like Mangroves. It differs in nothing from *Ardisiads* beyond this, that the fruit, when ripe, becomes a follicle, the seed has no albumen, and the anther-cells are cut transversely; to which Alph. De Candolle adds that the stalk of their central placenta is very much lengthened during the period of ripening, and from being very short is finally converted into a long and false funiculus. It does not, however, appear to me advisable to distinguish the genus from *Ardisiads*, for it may be conjectured that the absence of albumen, which is one of the most important marks of distinction, is owing to the peculiar circumstances under which *Ægiceras* germinates; its embryo is always developed in an atmosphere charged with moisture, and hardly requires that any special preparation should be made for sustaining it in its infant state. The only genus known is

*Ægiceras*, Gærtner.

*Malaspinara*, Presl.

of which 5 species are on record, whereof one is doubtful.



# ALLIANCE XLVIII. *ECHIALES*—THE THORN AGURRY

DIAGNOSIS.—*Perigynous* flowers, with *dichlamydeous*, *monophyllous*, *apocarpous*, or *unisexuotricus* fronds; *monocarpellous* fruit, consisting of *reticulated* seed; a *few* *clusters* of *stamens* *in* *apocarpous*, and a *large* *single* *one* *with* *longer* *or* *shorter* *filaments*.

About the close affinity of all the Orders here collected into the same Alliance, no one seems to entertain a doubt, with three exceptions, to be noticed in passing. They might in fact be in part referred to *Salmidals* and in part to *Coronae*, but these have line, or deeply lobed fruit, offers a good supply of *filaments*. *Echiales* have indeed be regarded as a group so intermediate between *Salmidals* and *Coronae*, that part people be referred to the one and part to the other, the regular-flowered Orders joining the former, the irregular-flowered the latter. Perhaps it would not be advisable to distinguish the first half from *Salmidals* if it were not for their want of *alliance*; but this, although not a universal character among them, yet it is so common as to deserve the separate notice.

The Orders least certainly stationed are *Junoniae*, *Salvadorae*, and *Hesperiae*, but no better position seems discoverable for them. The tendency to irregularity and the deeply-lobed ovary seem to determine the place of *Junoniae*, especially when the minute quantity of albumen present in their seeds is taken into account; as in *Salvadorae* they seem to approach *Chiridales* as much as anything; and *Hesperiae* may be as well compared with the *clauschordae* *Junoniae* as with *Junoniae*, or *Goodeniads*, from both which they deviate so entirely in the nature of their fruit.

The true position of the *Echial* Orders with respect to each other, according to these views, may be represented thus:—

<i>Order</i> —	<i>Junoniae</i> .
	<i>Salvadorae</i> .
	<i>Chiridales</i> — <i>Nepenthes</i> — <i>Salmidals</i> .
	<i>Junoniae</i> — <i>Salvadorae</i> — <i>Hesperiae</i> .
	<i>Junoniae</i> .
	<i>Salvadorae</i> .
	<i>Chiridales</i> .
	<i>Junoniae</i> .

## NATURAL ORDERS OF *ECHIALES*.

- *Regular-flowered Orders, passing from Salmidals.*

<p><i>Flowers regular, 2-l., anisopentapetal.</i> Stamens 2. Fruit 3-l.</p> <p><i>lobed. Stigma naked.</i> . . . . .</p>	}	Low <i>Junoniae</i> .
<p><i>Flowers regular, symmetrical.</i> Stamens 4. Fruit single.</p> <p><i>Stigma naked.</i> . . . . .</p>	}	Mid. <i>Junoniae</i> .
<p><i>Flowers regular, symmetrical.</i> Stamens 5. Stigma naked.</p> <p><i>Nuts 4, confluent. Lophocarpous.</i> . . . . .</p>	}	Mid. <i>Junoniae</i> .
<p><i>Flowers regular, symmetrical.</i> Stamens 5. Nuts 4 or 8.</p> <p><i>Stigma naked. Lophocarpous.</i> . . . . .</p>	}	Mid. <i>Junoniae</i> .
<p><i>Flowers regular, symmetrical.</i> Stamens 5. Nuts 4 or 8.</p> <p><i>Stigma naked. Lophocarpous.</i> . . . . .</p>	}	Mid. <i>Junoniae</i> .
<p><i>Flowers regular, symmetrical.</i> Nuts confluent. Stigma with 4 or 5 sorts. (Stamens 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.</p>	}	Mid. <i>Junoniae</i> .
- *Irregular-flowered Orders, passing into *Junoniae*.*

<p><i>Flowers irregular, anisopentapetal.</i> Nuts 3. (and 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.</p>	}	Mid. <i>Junoniae</i> .
<p><i>Flowers irregular, unsymmetrical.</i> Nuts confluent. (and 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 10</p>		



## ORDER CCXLIX. JASMINACEÆ.—JASMINWORTS.

Jasminæ, *Juss. Gen. Plant.* 104. (1789) in part; *R. Brown Prodr.* 520; *Endl. Gen.* cxxix.; *Alph. DC. Prodr.* 8. 300.—*Bolivariæ, Griseb. Gent.* 20.; *Endl. Gen. Suppl.* 2. 55.

DIAGNOSIS.—*Echial Exogens*, with 2 distinct lobes to the fruit, 2 stamens, a naked stigma, and regular unsymmetrical flowers.

Shrubs, often having twining stems. Leaves opposite or alternate, mostly compound, ternate or pinnate, with an odd one; sometimes simple, the petiole almost always



Fig. CCCXXXV.

having an articulation. Flowers opposite, in corymbs, white or yellow, often sweet-scented. Calyx with 5 to 8 divisions or teeth, persistent. Corolla monopetalous, hypogynous, regular, hypocrateriform, with from 5 to 8 divisions, which lie laterally upon each other, and are twisted or valvate in æstivation. Stamens 2, arising from the corolla, inclosed within its tube. Ovary destitute of an hypogynous disk, 2-celled, 2-lobed, with from 1 to 4 erect anatropal ovules in each cell; style 1; stigma 2-lobed. Fruit either a double berry or capsule. Seeds either with no albumen or very little, their skin tumid or membranous; embryo straight; radicle inferior.

Jasminworts were formerly combined with Oliveworts, from which Brown distinguished them by their ovules being erect, their seed with no, or very little, albumen, by the æstivation of the corolla being imbricate, not valvate, and by the number of its divisions being five or more, and consequently not regularly

a multiple of the stamens, instead of 4, which is a multiple of them. Ach. Richard endeavours to show that these differences are insufficient. He states, that the ovules of Jasminworts are originally pendulous, as in Oliveworts, but that they subsequently become erect in consequence of the growth of the ovary, whose apex does not elongate, while its sides extend considerably during the growth of the fruit. He says, upon the authority of his father, that albumen does exist in *Jasminum* and *Nyctanthes*; a fact which had been previously mentioned by Brown in defining the Orders, but to which that distinguished Botanist attached no importance, because only a small quantity was found by him to exist, while it is abundant in Oliveworts; and he probably conceived, as I certainly do, that it is the difference of its quantity only which gives the albumen value as a mark of ordinal distinction. But it does not appear to me that Jasminworts have any real connection with Oliveworts; on the contrary, their unsymmetrical flowers and deeply-lobed fruit suggest a very different affinity, and seem to point distinctly to those monopetalous Orders in which the number of stamens is different from that of the divisions of the corolla, such as Labiates and Verbenes, but particularly the latter, which sometimes resemble Jasminworts in their fruit, as happens in *Clerodendron*. Brown stations them between Pedaliads and Oliveworts; De Candolle between Oliveworts and Loganiads. Endlicher indicates an approach to Dogbanes. To me they seem to be the connecting point between the Cortusal and Echial Alliances, touching the former at Ardisiads and the latter at Verbenes or Labiates.

Chiefly inhabitants of tropical India, in all parts of which they abound. One *Jasminum* only is mentioned from South America, but there are at least 3 species of *Bolivia* on that continent; a few are natives of Africa and the adjoining islands; New Holland contains several; and, finally, 2 extend into the southern climates of Europe.

Of some species the oil produced by the flowers is deliciously fragrant. The genuine

Fig. CCCXXXV.—*Jasminum ligustrifolium*. 1. a corolla cut open; 2. vertical section of the ovary; 3. section of a seed of *Nyctanthes*.—*Gartner*



essential oil of *Jasminum* of the above is obtained from *Jasminum officinale* and *J. grandiflorum*; but a smaller quantity is also procured from *Jasminum* species. The leaves of *Jasminum* induratum are slightly bitter. The leaves of *Jasminum grandiflorum* are bitter, ground small and mixed with powdered *Acacia* balsam form a cathartic. India is a valuable external application to most of the species. In the East Indies, the leaves of *Nysa glabra* (which grows in India) are used as a cathartic. The leaves of the *Horsing* (at India) are used as a cathartic. The leaves of *Jasminum* are collected like those of the *Chamædorea* (which grows in India) and used as a cathartic, or mixed with the leaves of the *Chamædorea* and used as a cathartic. The leaves of *J. pubescens* is thought to be a cathartic.

GENERA

<i>Jasminum</i> , L.	<i>Syntherisma</i> , L.	<i>Isotriaena</i> , DC.	<i>Samolus</i> , L.
<i>Myrsine</i> , Juss.	<i>Psychotria</i> , Gaertn.	<i>Psychotria</i> , Gaertn.	<i>Psychotria</i> , Gaertn.
<i>Nysa</i> , Juss.			

*Nysa*, Gaertn. *Isotriaena*, DC.

Position.—*Verticillata*—*Jasminum*, *Isotriaena*, *Samolus*, *Psychotria*, *Myrsine*.

The bitter leaves of *Jasminum grandiflorum* have a very powerful cathartic effect, and are employed in Abyssinia against the tape-worm.—*A. Brinkley*.

ADDITIONAL NOTES

1. *Jasminum*, L. *Isotriaena*, DC. *Samolus*, L. *Psychotria*, Gaertn.



## ORDER CCL. SALVADORACEÆ —SALVADORADS.

Salvadoraceæ, *Ed. pr. No. cxcix.* (1836); *Endl. Gen. p. 349.*DIAGNOSIS.—*Echial Exogens*, with regular symmetrical flowers, a solitary fruit, and naked stigma.

Small trees or shrubs, with the stem slightly tumid at the articulations. Leaves opposite, leathery, entire, very obscurely veined. Flowers minute, in loose panicles. Calyx inferior, 4-leaved, minute. Corolla membranous, monopetalous, 4-parted. Stamens 4, connecting the petals into a monopetalous corolla; anthers round, 2-celled, bursting longitudinally. Ovary superior, 1-celled, with a single sessile stigma; ovule solitary, erect. Pericarp berried; 1-celled, indehiscent. Seed solitary, erect. Embryo amygdaloid, without albumen; cotyledons fleshy, plano-convex, fixed a little below their middle to a long axis, the radicle of which is inclosed within their bases.



Fig. CCCCXXXVI.

pericarp. In habit it agrees with *Galenia*, and this has probably been the cause of its having found its way to *Chenopods*. It seems however possible, upon the whole, that it should be considered an ally of *Ehretiads* or *Verbenes*, having but one carpel and symmetrical tetrandrous flowers.

The species are found in India, Syria, and North Africa.

*Salvadora persica*, the Mustard-tree of Scripture, as has been demonstrated by Dr. Royle, has a succulent fruit which has a strong aromatic smell, and tastes like Garden-creese. The bark of the root is remarkably acrid; bruised and applied to the skin it soon raises blisters, for which the natives of India often use it. As a stimulant it promises to be a medicine of considerable power. The leaves of *S. indica* are purgative; the fruit is said to be eatable.

M. Planchon, who has reconsidered this Order (*Ann. Sc.*, 3 ser. X. 191), thinks it allied to *Oleads*, through *Bouea*, which probably belongs here rather than to *Anacards* (see p. 467). He supposes the following genera to be referable to this place:—

## GENERA.

*Salvadora*, L.  
*Monetia*, L'Her.  
*Actima*, Lam.  
*Actegelon*, Bl.

*Dobera*, Juss.  
*Tomex*, Forsk.  
*Schizocalyx*, Hochst.  
*Bouea*, Meisner.  
*Cumbessedea*, Wight.

NUMBERS. GEN. 4. Sp.

*Plumbaginaceæ* ?POSITION.—*Ehretiaceæ*.—SALVADORACEÆ.—*Verbenaceæ*.*Oleaceæ* ?



## ORDER CCLI. EHRETIACEAE. EURETIACEAE.

[illegible]

DIAGNOSIS.—*E. fidi* *Leconte*, with regular granulation above, tubercles below, and a naked stigma, and previous differences.

Trees or shrubs, or herbaceous plants, with a hardy subshrub. Leaves alternate, without stipules. Flowers axillary. Calyx tubular, 5- parted, imbricated in aestivation. Corolla monopetalous, tubular, with as many segments of its limb as the calyx, with an imbricated aestivation. Stamens alternate with the segments of the corolla, and equal to them in number, arising from the bottom of the tube; anthers imbricate. Ovary seated in an annular disk, 2- or more-celled; style terminal; stigma simple, 2-lobed; ovules suspended. Fruit drupaceous, with as many seeds as there are true cells of the ovary. Seed suspended, solitary; testa simple, thin; embryo in the midst of thin fleshy albumen, or without any; radicle superior; cotyledons plano-convex.

A branch of the old Boraginæ, distinguished by a terminal style proceeding from the apex of a perfectly concrete ovary of 4 cells, a baccate fruit, and seeds furnished with thin fleshy albumen. The Order is recognised with Borageworts by Alph. De Caneille, but it seems sufficiently characterised by its concrete carpels, and the presence of a small quantity of albumen. The separate, not separable, nuts of Borageworts are so peculiar, notwithstanding that Cornutæ has them combined in pairs, that a real objection seems to exist to the disregard of so good a mark, by the combination with them of these concrete-fruited Ehretiads.

Most of them are tropical trees or shrubs, but a few are found in the south of Europe and the Southern States of America (but none as far north as the parallel of  $45^{\circ}$ ).

The root of *Liriodia luxifolia* is reckoned in India one of those roots which are in altering and purifying the habit in cases of cancer, and venereal diseases of standing. *Tiuridium indicum* is represented to be an anodyne, and useful to the soldiers, or to allay inflammation, Marini says with undoubted advantage. *Tiuridium umbellata* has a similar application in Mexico, where it is now treated by a Libani, and it is to be observed that the leaves of *Heliotropium curassavicum* were formerly used in the same way as *Tiuridium*. Some *Liriodia* bear rather disagreeable odour, the odour of the Peruvian *Heliotropia* is known to everybody.



## The Authors

# CONTENTS

[illegible]

NUMBERS ONE TO TEN

**References**

Position.—Benignancy.—History and Pathogenesis.

Fig. 6. CCCCXXXVII. — Reticular system. — Ovarian. 1. The basal. 2. The intermediate. 3. The dorsal section of the ovary. 4. A part of the same section as in 3.



## ORDER CCLII. NOLANACEÆ.—NOLANADS.

Nolanaceæ, *Lindl. Nixus Pl.* 18. (1833); *Martius Conspectus*, No 119; *Endl. Gen.* p. 655; *Lindl. in Bot. Reg.* 1844. t. 46.

DIAGNOSIS.—*Echial Exogens*, with regular symmetrical flowers, 5 stamens, 5 or more nuts, distinct or partly confluent, a naked stigma, and straight inflorescence.

Prostrate or erect, herbaceous or suffruticose plants. Leaves alternate, without stipules. Flowers usually showy. Calyx 5-parted, valvate in æstivation. Corolla monopetalous, with a plaited æstivation, usually thickened in the tube. Stamens 5, equal, inserted into the tube, alternate with the segments of the corolla; anthers oblong, 2-celled, bursting longitudinally. Pistil composed of several carpels, either distinct with a single style, or partially combined into several sets with a single style seated on a succulent disk. Stigma somewhat capitate. Fruit inclosed in the permanent calyx, constructed like the pistil; pericarp woody, often a little succulent; seeds ascending, solitary; embryo curved, with either straight or doubled cotyledons, in the midst of a small quantity of albumen; radicle next the hilum.

The genus *Nolana*, sometimes referred to Borageworts, sometimes to Bindweeds, has been erected into a distinct Order, on account, on the one hand, of its regular plaited corolla and valvate calyx, and, on the other, of its separate carpels though united styles. Among the regular-flowered *Echials* Nolanads can only be compared to Borageworts, from which they are certainly distinguished by their pentamerous fruit and straight inflorescence. There is some doubt whether the genera *Falkia* or *Dichondra* belong to Bindweeds or to Nolanads. With the latter those genera agree in their separate ovaries, with the former in the structure of their embryo; with both they disagree in the entire separation of their styles. If we attend to the embryo, they will stand among Bindweeds; if to the carpels, among Nolanads; but as their separate styles are nearly paralleled by those of *Evolvulus* and others, it seems upon the whole better to refer them to Bindweeds. *Schlechtendahl* suggests (*Linnaea*, t. 72) that *Nolana* may be referred to Nightshades, on account of its affinity with *Grabowskia boerhaaveifolia*, in which the fruit contains two bilocular menospermous stones; and it must be confessed that some of the shrubby Nolanads have much the habit of *Lycium*.

This little Order is remarkable for the various modes in which its carpels are disposed without ever being consolidated. In one genus there are but 5, and they are distinct; in another there are 20 combined in fours; in a third the combination is irregular though the number remains 20; and in others they are all wholly distinct. The late Professor *Don* thought that *Triguera* must be referred here.

The species are all South American, and chiefly Chilean.  
Their uses are unknown.

## GENERA.

*Nolana*, *Linn.*  
*Wulkeria*, *Ehret.*  
*Zwingera*, *Hofer.*

*Teganium*, *Schmidt.*  
*Neudorffia*, *Adans.*  
*Alona*, *Lindl.*

*Dolia*, *Lindl.*  
*Alibrexia*, *Miers.*

*Sorema*, *Lindl.*  
*Aplocarya*, *Lindl.*

NUMBERS. GEN. 6. Sp. 35.

*Convolvulacæ.*

POSITION.—Boraginacæ.—NOLANACEÆ.—

*Solanacæ.*



FIG. CCCCXXXVIII.

Fig. CCCCXXXVIII.—1. *Alona celestis*; 2. its pistil; 3. a transverse section of it; 4. section of seed of *Nolana prostrata*; 5. part of the fruit of *Aplocarya divaricata*.



Order, CCLIII. DIAPYCNTERA, n. sp.

*Diapycntera*, *Jour. Sci. Am.* (N. Y.), 1885, p. 10. *Diapycntera*, *Jour. Sci. Am.* (N. Y.), 1885, p. 10. *Diapycntera*, *Jour. Sci. Am.* (N. Y.), 1885, p. 10.

*Diapycntera*, *Jour. Sci. Am.* (N. Y.), 1885, p. 10. *Diapycntera*, *Jour. Sci. Am.* (N. Y.), 1885, p. 10. *Diapycntera*, *Jour. Sci. Am.* (N. Y.), 1885, p. 10.

Herbaceous plants or shrubs. Stems erect, leaves opposite, often sessile, sometimes consisting of hairs proceeding from an enlarged scarious base. Flowers



FIG. 1000-1004.

Isolated gyrate spikes or racemes, or panicles, sometimes solitary and sessile. Bracts persistent, with 4 or 5 divisions. Corolla hypogynous, campanulate, generally regular, 5-cleft, sometimes 4-cleft, with an lobed or undulate margin. Stamens inserted upon the corolla, equal to the number of its lobes and alternate with them, from 4-parted, 4-seeded, or 2-parted, divided; anther attached to the lower part of the cavity, apical; style simple, ending from the base of the ovary in the stigma simple or bifid. Nuts 2 or 4, distinct. Seed separate from the pericarp, destitute of albumen. Embryo with a superior cotyledon, cylindrical, parallel with the axis, plano-convex, sometimes 4 to 5. Anisotropy.

The plants of this Order are mostly allied to *Euphorbia*, those which they are sometimes distinguished by the regularity of the corolla, the presence of 2 bracts, and the absence of resinous dots in the foliage, a four (not square) shaped stigma, a green

FIG. CCCCXXXIX.—1, *Synedrella nodiflora*; 2, 3, 4, flowers of the same; 5, a single flower, the calyx opened, with two of the stamens; 6, a fruit; 7, a seed.



inflorescence, and scabrous alternate leaves. On account of this last character, they are sometimes called *Asperifoliæ*. From Nolanads they are distinguished by their inflorescence being gyrate, their radicle superior, and their embryo exalbuminous and straight. From all other Orders of this Alliance they are known by the 4 deep lobes of the ovary, called by Linnaean Botanists naked seeds.

Among the more remarkable points of structure met with in this Order is the very general presence of scales or tubercles, standing on the corolla between the stamens. At first sight such scales might be taken for mere folds of the corolla, but their peculiar appearance in *Symphytum* and *Borage* leads to the suspicion that they are really a series of abortive stamens.

Natives principally of the temperate countries of the northern hemisphere; extremely abundant in all the southern parts of Europe, the Levant, and middle Asia; less frequent as we approach the arctic circle, and almost disappearing within the tropics. A few species only are found in such latitudes. In North America they are less abundant than in Europe. Pursh reckons but 22 species in the whole of his Flora; while the little island of Sicily alone contains 35, according to Presl.

Soft, mucilaginous, emollient properties, are the usual characteristics of this Order; some are also said to contain nitre, a proof of which is shown by their frequent decrepitation when thrown on the fire. *Borago officinalis* gives a coolness to beverage in which its leaves are steeped. The whole plant has an odour approaching to Cucumber and Burnet; but its supposed exhilarating qualities, which caused *Borage* to be reckoned one of the four cordial flowers, along with Alkanet, Roses, and Violets, may justly be doubted.—*Smith*. It was once esteemed as a pectoral medicine, and a decoction of its leaves mixed with honey makes a good ptisan. Its young leaves make a pickle in some esteem. *Echium plantagineum*, naturalised in Brazil, is used in that country for the same purpose. The roots of *Anchusa tinctoria*, or Alkanet, of *Lithospermum tinctorium*, *Onosma echioides*, *Echium rubrum*, and *Anchusa virginica*, contain a reddish-brown substance used by dyers. This matter is thought to be a peculiar chemical principle, approaching the resins. The species of *Trichodesma* are considered diuretic, and are one of the cures for snake bites in India.—*Royle*. Some say that *Cynoglossum officinale* is narcotic; its leaves are bitterish and produce a fat strong-scented oil. Comfrey, *Symphytum officinale*, was formerly regarded as a vulnerary; if gathered while tender its leaves are a substitute for Spinage, and the young shoots, blanched by being forced to grow through heaps of earth, are eaten like Asparagus; it is not, however, valued by persons of refined taste. Its roots abound in mucilage, and are sweetish with some astringency.

#### GENERA.

(As given in DC. Prodr., Vol. X.)

##### § 1. CERINTHEÆ.

*Cerinthe*, *Tourn.*

##### § 2. ECHIEÆ.

*Lobostemon*, *Lehm.*

*Echiopsis*, *Rchb.*

*Echium*, *L.*

*Macrotomia*, *DC.*

*Echiochilon*, *Desf.*

*Chilochium*, *Raf.*

##### \* § 3. ANCHUSEÆ.

*Nonnea*, *Medik.*

*Oskampia*, *Mench.*

*Onochilus*, *Mart.*

*Borago*, *Tourn.*

*Psilostemon*, *DC.*

*Trachystemon*, *D. Don.*

*Symphytum*, *L.*

*Stomotechium*, *Lehm.*

*Caryolopha*, *Fisch.*

*Pentaglottis*, *Tausch.*

*Anchusa*, *L.*

*Buglossum*, *Tourn.*

*Gastrocotyle*, *Bunge.*

*Toxostigma*, *A. Rich.*

*Lycopsis*, *L.*

*Moritzia*, *DC.*

##### § 4. LITHOSPERMEÆ.

*Onosma*, *L.*

*Colsmannia*, *Lehm.*

*Macromeria*, *G. Don.*

*Onosmodium*, *Mich.*

*Purshia*, *Spreng.*

*Osmodium*, *Raf.*

*Maharanga*, *A. DC.*

*Moltkia*, *Lehm.*

*Lithospermum*, *L.*

*Batschia*, *Gmel.*

*Egonychium*, *Gray.*

*Rhytospermum*, *Link.*

*Sericostoma*, *Stocks.*

*Pentalophus*, *A. DC.*

*Mertensia*, *Roth.*

*Hippoglossum*, *Hartm.*

*Casselia*, *Dumort.*

*Steenhammaria*, *Rchb.*

*Pulmonaria*, *L.*

*Bessera*, *Schult.*

*Arnebia*, *Forsk.*

*Dioclea*, *Spreng.*

*Menehimia*, *Endl.*

*Strobila*, *G. Don.*

*Alkanna*, *Tausch.*

*Baphorhiza*, *Link.*

*Campocarpus*, *C. Koch.*

*Stenosolenium*, *Turcz.*

*Meratia*, *A. DC.*

*Myosotis*, *L.*

*Exarrhena*, *R. Br.*

*Strophostoma*, *Turcz.*

*Bothriospermum*, *Bunge.*

##### § 5. CYNOGLOSSEÆ.

*Amsinckia*, *Lehm.*

*Benthania*, *Lindl.*

*Gruvelia*, *A. DC.*

*Pectocarya*, *DC.*

*Ktenospermum*, *Lehm.*

*Antiphytum*, *DC.*

*Eritrichium*, *Schrad.*

*Cryptantha*, *Lehm.*

*Plagiobothrys*, *Fisch.*

*Krynitzkia*, *Fisch.*

*Echinospermum*, *Sweart.*

*Lappula*, *Mench.*

*Rochelia*, *R. & S.*

*Hackelia*, *Opiz.*

*Heterocaryum*, *A. DC.*

*Asperugo*, *L.*

*Cynoglossum*, *L.*

*Omphalodes*, *Tourn.*

*Picotia*, *R. S.*

*Suchtelenia*, *Karel.*

*Solenanthus*, *Ledeb.*

*Diploloma*, *Schrenk.*

*Mattia*, *Schultz.*

*Rindera*, *Pall.*

*Trichodesma*, *R. Br.*

*Pollichia*, *Med.*

*Streblanthera*, *Steud.*

*Friedrichsthalia*, *Fenzl.*

*Craniopspermum*, *Lehm.*

##### § 6. ROCHELIEÆ.

*Rochelia*, *Rchb.*

? *Marelia*, *Vand.*

NUMBERS. GEN. 54. Sp. 683.

*Hydrophyllaceæ.*

POSITION.—*Lamiaceæ.*—*BORAGINACEÆ.*—*Nolanaceæ.*

*Cordiaceæ.*



ORDER CCLIV. BRUNONIACEAE. *Brunonia*

Goodenough, J. Z. *R. Texas J. Sci.*, 53: 111-112, 1953. (University of Texas, Austin, Texas.) (Received for publication, March 19, 1953.)

DIAGNOSIS.—*E. lat. long.* is, with regular expansion and contraction, a pulsing body, much narrower

Herbaceous plants, without stems, and with simple, glabrous leaves. Leaves ovate, entire, with no stipules. Flowers on scape, collected in heads, sessile, about 1

Flowers on scape, clustered in heads, surrounded by bracts, blue. Ovary free, in a fleshy, white, succulent base. Growth monopetalous, almost round, a petal-like withering. Stamens definite, hypogynous, filaments segments of the corolla; anthers fused toward the center, slightly nodding. Ovary trilocular, with erect, striated seed; style simple; stigma with a 2-valved cap. Fruit a capsule, the tube of the hardened tube of the calyx. Seed elliptical, allanien; embryo with phloemoxylem ducts and minute inferior radicle.

2 The solitary group forming this Order was named by Brown as a section of *Convolvulus*, from which it differs essentially in the superior (smaller) hairy and ligulate flower thus approaching certain *Ipomoeas*, but differing in the want of an involucral bract, and in the opposite arrangement of the stigmata. With reference to this *Ipomoea* group, Schumacher agrees with Gussone in the fundamental position of the stigmata, in the structure and composition of the anthers of the seed being erect, and generally in the position of the corolla. It differs from those in having both

[illegible]

frequently the case in *Brunonia sericea*, or (as in *B. americana*) scarcely so, the long recurrent branches, forming lateral nerves, at first eight resembling those of *C. sericea*, but which hardly reach to the base of the filament. It is evident, therefore, that *Brunonia* should so completely differ from *C. sericea* in the structure of the corolla, while both Orders agree in the presence of a filament, a character which had been observed in a very few *C. sericea* specimens. The publication of M. Cassini's second Dissertation, which is to be printed by the Academy, will be universal in the Order. In the opposite portions of the manuscript of *Brunonia* two new

**Fig. CCCXL.**—*Brunelia setacea*.—P. Denny. A, & B, embryos. C, fruiting branch. D, fruiting branch.



or vascular cords are observable, which are continued into the style, where they become approximated and parallel. This structure, so nearly resembling that of *Compositæ*, seems to strengthen the analogical argument in favour of the hypothesis of the compound nature of the pistillum in that Order, and of its type in phænogamous plants generally; *Brunonia* having an obvious and near affinity to *Goodenoviæ*, in the greater part of whose genera the ovarium has actually two cells with one or an indefinite number of ovula in each; while in a few genera of the same Order, as *Dampiera*, *Diaspasis*, and certain species of *Scevola*, it is equally reduced to one cell and a single ovulum." The habit of the Order is much that of *Globularia*. But its most immediate affinity seems to be collaterally with *Nolanads*, which it appears to combine with such genera as *Phyteuma* among *Bellworts*. Its hypogynous stamens are, however, so peculiar that we may well doubt whether the true affinity of the plant can yet be demonstrated.

Natives of New Holland.

Their properties are unknown.

GENUS.

*Brunonia*, Sm.

NUMBERS. GEN. 1. Sp. 2.

*Goodeniaceæ*.

POSITION.—*Nolanaceæ*.—BRUNONIACEÆ.—

*Campanulaceæ*.

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M. Alphonse De Candolle suggests an affinity with *Leadworts* (*Plumbaginaceæ*), in which also there are scarious bracts, and sometimes hypogynous stamens. (*Prodr.* XII. 616.)



ORDER CCLV. LAMIAEAE. *Fern.*

Lab. Nat. Mus. Mex. 110, 1789. In *Hist. Nat. Mex.*, 1845, 1846, 1847, 1848, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521,

**Diagnosis.** *Exilis Exilis*, complete segmental fusion, and 1 small one

Herbaceous plants or under shrubs. Stem decumbent, rarely upright, quadrangular. Leaves opposite, divided or undivided, without cartilaginous sheath.

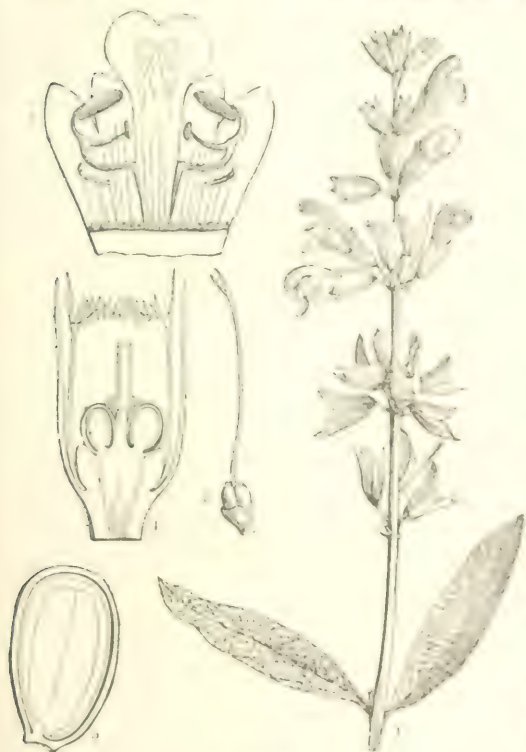


FIG. 6666XII.

nuts, inclosed within the persistent calyx. Embryo erect; cotyledons flat.

The 4-lobed ovary, with a solitary style arising from the base of the ovary, is so parallel among monopetalous didynamous Orders. The only one of the Labiales with Verbenes, which chiefly differ in their undivided corolla. The Labiales differ both in having an irregular corolla, and not more than four longitudinal lobes of the corolla are 5, square stems, and opposite leaves. Labiates resemble some Figworts. From all these words may be inferred the absence of fructification, by their square stem and the opposite leaves, and by their leaves. According to Girschick, three orders are distinguished by the

[illegible]



Oranges and other plants, but are little utricles having an open orifice ; and hence he calls them pores. For some good remarks upon the anatomy of the stem of Labiates, see Mirbel in the *Annales du Muséum*, vol. 15, p. 223. The aestivation of the corolla of this Order, first well pointed out by Brown, is an important consideration in determining whether a flower is resupinate or not. Prostanthera is remarkable for the remains of albumen existing in the ripe seeds of several of its species. Oxera of La Billardiére has been lately re-examined by M. Fenzl, who finds that its structure was, as I suspected, entirely misunderstood, and that the lobes of its ovary contain each a conical, solitary, fleshy placenta, from the apex of which one ovule hangs down. He refers the plant to Verbenes ; but its lobed ovary is an objection, and the pendulous position of the ovules, being due to the unusual extension of their placenta, in consequence of which they cannot be erect, need not, under such circumstances, be taken into account.

Natives of temperate regions, in greater abundance than elsewhere, their maximum probably existing between the parallels of 40° and 50° N. latitude. They are found in abundance in hot, dry, exposed situations, in meadows, hedgerows, and groves ; not commonly in marshes. In France they form 1-24th of the Flora ; in Germany, 1-26th ; in Lapland, 1-40th ; the proportion is the same in the United States of North America, and within the tropics of the New World (*Humboldt*) ; in Sicily they are 1-21 of flowering plants (*Presl.*) ; in the Balearic islands, 1-19th. About 200 species are mentioned in Wallich's *Catalogue of the Indian Flora*, a large proportion of which is from the northern provinces. They were not found in Melville Island.

Labiates are in all cases destitute of any deleterious secretions ; for the most part they are fragrant and aromatic, have been used as tonics, and are valuable as kitchen herbs, for sauces, and flavouring cooked dishes ; some are employed by perfumers, many are admired for their beauty, especially species of Sage ; some furnish a substance resembling Camphor in its nature ; a small number are simply astringent, and a very few are eatable, though perhaps not worth eating, such as the roots of *Stachys palustris*, which is the Panax Coloni of old writers, and some species related to *Ocimum*, whose tubers are reported to be a common esculent in Madagascar. Without pretending to make a list of all the uses to which these common plants have been applied, a small number of cases will be found a sufficient indication of them.

Among the mere aromatics the most celebrated is the Patchouli, or Pucha pat, some unknown species of *Plectranthus* or *Coleus*, a plant of which large quantities are exported from Penang, for stuffing mattresses and pillows. Its strong-smelling leaves are supposed to keep off contagion.—*Pharm. Journ.* iv. 81. It is used in this country as an article of perfumery. Next to this comes Lavender, the *Lavandula vera* of De Candolle. The flowers of this plant contain a fragrant volatile oil in great abundance, together with a bitter principle. They are carminative, stimulant, and tonic, but are more employed in perfumery than in medicine ; the leaves and flowers have been used as sternutatories. Oil of Lavender is obtained by distillation, and is sometimes given in hysteria and nervous headache ; it enters into the composition of Eau de Cologne and the Vinaigre aux quatre voleurs. French Lavender, *Lavandula Spica* of De Candolle, is less fragrant, and not employed medicinally. It yields what is called Oil of Spike, which is used by painters on porcelain, and in the preparation of varnishes for artists. The oil of *Mentha citrata* is extremely fragrant, with much the odour of oil of Bergamot.

These fragrant and aromatic qualities render many valuable as stimulating medicines. Mint, for example (*Mentha viridis*), is not merely used as a sauce, but as an aromatic and carminative, in the form of oil of Spearmint and Spearmint water. Pennyroyal, the *Mentha Pulegium*, and the *Menthas rotundifolia*, *aquatica*, and *arvensis* have similar qualities, but the most useful among them is Peppermint, an aromatic stimulant, and the most pleasant of all the Mints. It is employed in medicine for several purposes, principally to expel flatus, to cover the unpleasant taste of other medicines, and to relieve nausea and griping pains of the alimentary canal. The volatile oil is sometimes taken as an antispasmodic ; it is what gives their flavour to Peppermint lozenges.—*Pereira*. Hedeoma pulegioides, the Pennyroyal of the North Americans, has a great popular reputation as an emmenagogue. *Cunila mariana* is beneficially employed in infusion in slight fevers and colds, with a view to excite perspiration. *Leonotis nepetifolia*, *Leucas martinicensis*, *Marsipanthus hyptoides*, are all employed in Brazil for medicating baths prescribed for rheumatic attacks. Some are diuretics and diaphoretics, such as *Æollanthus suavis*, used in Brazil in spasmodic strangury, *Glechom spathulatus*, *Ocimum inae-nescens*, *Peltodon radicans*, and many kinds of *Hyptis*. As carminatives and antispasmodics we have all the culinary species, such as Mint (*Mentha viridis*), Basil (various species of *Ocimum*), Marjoram (of *Origanum*), Savories (of *Satureia*), *Lavandula Stæchas*, used in Arabia as an antispasmodic, Sage (*Salvia officinalis* and *grandiflora*), *Meriandra benghalensis*, the Sage of Bengal, Thyme, Hyssop, &c. &c.

It is well known that Horehound (*Marrubium vulgare*) is a popular remedy for



coughs, in the form of infusion or of better made tincture, or even by powder made in the more severe forms of cold, restoring the tone of the stomach, and relieving the system when other remedies fail.—*The Aconite*, or *the Monk*, *Aconitum napellus*, is used in the same way in Brazil. As powerful medicines are first tested in this country, we find *Conium*, *Ivy*, which is largely employed by country people in this country, *Thapsus*, *Scilla*, *Leonurus Cardiacus*, *Balm* *Melissæ*, *Thymus*, and *Sedum* [*Melissa* *Carduacea*, &c.]. Some are used as febrifuges, among which may be mentioned *Hypericum*, *Leonurus* of Sierra Leone, *Fraxinea vulgaris* in South India, *Isopogon* *negundo*, which also yields a good black dye, and is used to help the appetite in *India*, *India*, *Melissa* *fistulosa*, a fragrant North American herb, and *Oreganum* *Michauxianum*, or *Demoulin* in Crete. One of the styptic plants, called *Mastic*, or *Ma*, is said by *Martius* to be a species of *Philomis*.

A Stearoptery resembling Camphire is to be obtained from various species, *Salvia*, *Savory*, and *Hyssop*, and *Marjoram* particularly, have been found to yield a plant which is reputed to furnish the most of *Essence of Stearoptery*. The plant has a great reputation otherwise; a strong decoction of the leaves is used to allay the heat of the skin in erysipelas; it has been employed as a specific remedy in relieving headache and exciting the mind to exertion. It is also celebrated for its undoubted power of encouraging the growth of hair, and curing baldness, as well as what causes the green colour of the best perennials used for that purpose; and it prevents the hair from uncurling in damp weather; it is, moreover, one of the plants employed in the manufacture of Hungary water, the French *Eau de Cologne*, and *Eau de Cologne*. The admired flavour of *Neroli* flower is ascribed to the bees feeding on the flowers of this plant.

is believed to be merely mechanical, and owing to the minus still there with which the leaves are covered. The statement that the root of the plant is "negative and passive" requires confirmation.

4 1 1 1 1 1

## I. O. MEAL.

## J. Macfarlane, 1881.

*Cochranella*, *Linn.*.  
*Lacuna*, *Forskell*.  
*Cochranella*, *Hoffm.*.  
*Pachyostoma*, *Pallas*.  
*Moschus*, *Bleeker*.  
*Acanthopneustes*, *Forsk.*.  
*Moschus*, *Rafinesque*.  
*Lamachus*, *Jacquelin*.

**Orthosiphon**, *Benth.*.  
*Rhabdium*, *Hillebrand*.

## 2. Phetrantidae.

*Platanthus, Herit.*  
*Gynerium, Lam.*  
*P. D. C. nat. Lam.*  
*Iselin, Schrad.*  
 Colors, *Lam.*  
*S. M. nat. nat. Schum*  
 Miller, Chap.  
 Anomalous, *W. H.*  
 E. M. nat. nat. *M. W.*  
 W. H. nat. *Wend.*  
 O. M. nat. *E. M. W.*  
 H. M. nat. *Schrad.*  
 P. M. nat. *W. H.*  
 H. M. nat. *E. M. W.*  
 H. M. nat. *E. M. W.*  
 Synchroton, *E. M. W.*

### 3. Hyptidæ.

*Peltodon*, *Faldl.*  
*Marsipharanthus*, *Muhl.*  
*Hyantes*, *Juncy.*  
*Gonion*, *Benth.*  
*Speridion*, *Benth.*  
*Apodites*, *Benth.*  
*Phacellia*, *Benth.*  
*Cyrtia*, *Benth.*  
*Campoplexus*, *Faldl.*  
*Eriosphæria*, *Benth.*  
*Oenophorus*, *Benth.*  
*Trichosphaeria*, *Benth.*

A small number of Mart.

*Polylestes*, Benth.  
*Myiophobus*, Benth.  
*S. schneideri*, H.  
*Proterops*, Benth.  
*Brachymeria*, Say  
*Minthidium*, Benth.  
*Ichneumon*, Benth.  
*Uroctonus*, Benth.  
*Synaldis*, Muls.  
*Hemiteles*, Muls.  
*Phaenocarpa*, H.

## 4. Negative

Lavandula, Linn.  
 Sp. Pl. 1000.  
 Pers. Syn. 1. 100.  
 Presl, Syn. 1. 100.  
 Presl, Syn. 1. 100.

## II. Model

1. *Phragmites*

**Polypropylene, Thick**  
**Dyeing & Finishing**

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

1. *Phyllanthus* (Linn.)  
 2. *Phyllanthus* (Linn.)  
 3. *Phyllanthus* (Linn.)  
 4. *Phyllanthus* (Linn.)

### 3. Method

Colletes, 1. Smith  
Femur, 1. 1. 1.  
Isopod, 1. 1. 1.  
Pteron, 1. 1. 1.  
Mouth, 1. 1. 1.  
Lycopodium, 1. 1. 1.

4. *M. M. A. A.*

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## 1.

[illegible]2. *Homocystis*[illegible]

11

**Citation:**

[illegible]



<i>Nepeta</i> , Benth. <i>Saussurea</i> , Mönch. <i>Caturia</i> , Mönch. <i>Glechoma</i> , Linn. <i>Chamaeclema</i> , Mönch. <i>Marmoritis</i> , Benth. <i>Dracocephalum</i> , Linn. <i>Moldavica</i> , Mönch. <i>Zornia</i> , Mönch. <i>Ruyschiana</i> , Mill. <i>Lallemantia</i> , Fis. et Mey. <i>Cedronella</i> , Mönch. <i>Chamaesphacos</i> , Schrenk.	<i>Lagochilus</i> Bung. <i>Yermolofia</i> , Belang. <i>Leonurus</i> , Linn. <i>Cardiaca</i> , Mönch. <i>Chaiturus</i> , Mönch. <i>Panzeria</i> , Mönch. <i>Galeopsis</i> , Linn. <i>Tetrahit</i> , Mönch. <i>Anisomeles</i> , R. Br. <i>Stachys</i> , Benth. <i>Betonica</i> , Linn. <i>Eriostachys</i> , Reich. <i>Eriostomum</i> , Link. et Hoffms. <i>Campanistrum</i> , Reich. <i>Trizago</i> , Link et Hoff. <i>Chamaesideritis</i> , Reich. <i>Aspasia</i> , E. Mey. <i>Zietenia</i> , Gled. <i>Sphacele</i> , Benth. <i>Phytozys</i> , Mol. <i>Cuminia</i> , Colla. <i>Lepechinia</i> , Willd.	<i>Hesiodia</i> , Mönch. <i>Burgsdorfia</i> , Mönch. <i>Acrotome</i> , Benth. <i>Marrubium</i> , Linn. <i>Lagopsis</i> , Bung. 4. <i>Ballotidæ</i> . <i>Ballota</i> , Linn. <i>Beringeria</i> , Neck <i>Pseudodictamnus</i> , Mön. <i>Acanthoprasium</i> , Bth. <i>Lasiocorys</i> , Benth. <i>Roylea</i> , Wall. <i>Otostegia</i> , Benth. <i>Leucas</i> , R. Br. <i>Hemistoma</i> , Ehrenb. <i>Leonotis</i> , Pers. <i>Leonurus</i> , Tournef. <i>Phlomis</i> , Linn. <i>Phlomoidea</i> , Mönch. <i>Phlomidopsis</i> , Link. <i>Notochæte</i> , Benth. <i>Eremostachys</i> , Bung. <i>Eriophyton</i> , Benth. <i>Moluccella</i> , Linn. <i>Molucca</i> , Tournef. <i>Chasmone</i> , Presl. <i>Hymenocrater</i> , F. et M.	<i>Achyrospermum</i> , Blum. <i>Siphotoxys</i> , Boj. <i>Lamprostachys</i> , Boj. <i>Colquhounia</i> , Wall. <i>Sestinia</i> , Boiss. X. <i>PRASIEÆ</i> . <i>Gomphostemma</i> , Wall. <i>Phyllostegia</i> , Benth. <i>Stenogyne</i> , Benth. <i>Prasium</i> , Linn. XI. <i>AJUGÆÆ</i> . <i>Amethystea</i> , Linn. <i>Trichostemma</i> , Linn. <i>Teucrium</i> , Linn. <i>Chamaedrys</i> , Tournef. <i>Scorodonia</i> , Tournef. <i>Scordium</i> , Tournef. <i>Polium</i> , Tournef. <i>Leucosceptrum</i> , Smith. <i>Teucropsis</i> , Ging. <i>Ajuga</i> , Linn. <i>Bugula</i> , Tournef. <i>Chamaepitys</i> , Tournef. <i>Phleboanthe</i> , Tausch. <i>Cymaria</i> , Benth.
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NUMBERS. GEN. 125. Sp. 2350.

POSITION.—Boraginaceæ.—LAMIACEÆ.—Verbenaceæ.  
Scrophulariaceæ.

*Teucrium Polium* is said to possess great power as a remedy for Asiatic cholera. See *Bulletin de l'Academie Nat. de Med.*, April 15, 1845.

The strong perfume called Puchá Pát, or Patchouli, is the *Pogostemon Patchouli* of Benthams; it grows wild at Penang. The common Catmint, a well-known feline aphrodisiac, is *Nepeta Cataria*.

## ADDITIONAL GENERA.

*Brazosia*, Engelm. near *Physostegia*.  
*Faldermannia*, Bunge, = *Ziziphora*.  
*Perilla* to be placed in *Ajugoidea*.

*Salviastrum*, Schede, next before *Salvia*.  
*Rhodochlamys*, Schauer, next *Macbridea*.



Order CCLVI. VERBENACEAE. *Verbena*.

[illegible]

Diagnosis.—*E. bil. E. par.*, with irregularly comminuted flange, slightly more, not so much.

Trees or shrubs, sometimes herbaceous compound, without stipules. Flowers sometimes in dense heads; very seldom axillary and solitary. Calyx tubular, persistent, inferior. Corolla hypogynous, monopetalous, tubular, deciduous, generally with an irregular limb. The aestivation of both imbricated. Stamens usually 4, didynamous, seldom equal, occasionally 2. Ovary 2- or 4-celled; ovules erect or ascending, anatropal or amphitropal, solitary or twin; style 1; stigma bifid or undivided. Fruit nucamentaceous, sometimes berried, composed of 2 or 4 nucleules in a state of adhesion. Seeds erect or ascending; albumen none, or fleshy; embryo always erect; radicle inferior.

The difference between these plants and Labiates consists in the connate carpels of *Verbenes*, their terminal style, and the usual absence of reservoirs of oil from their leaves, as contrasted with the deeply 4-lobed ovary and aromatic leaves of the latter. There are, however, particular species of *Labium* which approach *Verbenes* very closely; so that there has been much difficulty in distinguishing the two Orders. *Verbenes* differ from *Myoporaceae* in the position of the radicle, which in the former points to the base, and in the latter to the apex of the fruit. *Acanthads* and *Figworts* differ in not being monogamous. Brown states, that although all the genera of *Verbenes* have an oblique radicle points towards the base of the fruit, yet many of them have prothecium, and consequently a radicle remote from the umbilicus. As in the case of *Myoporaceae* that all, except *Avicennia*, have a sessile erect ovary arising from the base of the fruit. Brown, however, places *Avicennia* in *Myoporaceae*. Probably Mr. Lindley is right in suggesting that *Verbenes* and *Myoporaceae* are not really distinct, and would be better re-united.

The species of the Order are rare in Europe, northern Asia, and North America; common in the tropics of both hemispheres, and in the temperate countries of South America. In the tropics they become shrubs, or even small trees, but in more northern latitudes they are mere herbs.

The properties of *Verbenae* are much the same as those of *Lantana*. And this too, of importance in a medicinal or economical point of view. *Verbenae* being very rare, a peculiar subaromatic and slightly bitter taste, and is employed by the Portuguese when they cannot obtain *Netel* leaves; the Malays use it in the same manner. *Verbenae* *canariensis* is a plant to which the Malays attach the same medicinal value as *Netel*. It is known as *Verbenae* formerly did in the summer *Verbenae*. The leaves are used to adulterate Chinese Tea, and are sold in the American market under the name of Brazilian Tea. The expressed juice of the leaves is good as a tonic, and is very beneficial to children, in doses of 1 or 2 table-spoons. In the French West India Islands it is employed in decoction for dysentery, and also in the same manner in India. Moreover, some reputation for promoting the circulation of the blood. The dried leaves bruised are applied to ulcers; it is then called *Unguentum* *Verbenae*. *Verbenae* is also used in terms of high praise of the medicinal properties of *Verbenae* in the St. Hilare speaks in terms of high praise of the medicinal properties of *Verbenae* in the *Lantana pseudo-thea*, used in infusion as tea. It is highly esteemed in Brazil, where



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FIG. 666XIII.—*Callitriche floridana*. (1) Small round fruiting branch; (2) part of fruit of *C. americana* (Gerrard), 3-4 mm. diam.



it is vulgarly called *Capitão do matto*, or *Cha de pedreste*. Martius mentions several other *Lantanas* whose aromatic leaves and flowers are employed in coughs, and in medicating baths, and for rheumatism. He adds that *Lippia citrata* is also aromatic, and may be compared to Sage or Thyme. The bark of *Vitex Taruma* is used in South Brazil, under the name of *Taruma*, against syphilitic affections. The leaves of *Patagonula vulneraria* or *Ipébranco*, are asserted by Martius to be valuable in abating inflammatory action; it would seem to act like *Gmelina parviflora*, which has the power of rendering water mucilaginous, which is employed as a ptisan for the cure of ardor urinæ. *Congea villosa*, whose leaves have a strong heavy disagreeable smell, is another plant of the Order, used by the natives of India in fomentations. In India a decoction of the aromatic leaves of *Vitex Negundo* helps to form the warm bath for women after delivery; bruised they are applied to the temples for headache; pillows stuffed with them are put under the head to remove a catarrh and the headache attending. The leaves of *Vitex trifolia* are a powerful discutient, and employed by the Malays to remove the boss. The leaves are given in decoction and infusion, and formed into a cataplasm which is applied to the enlarged spleen. The root of *Premna integrifolia* is cordial and stomachic in decoction. *Volkameria inermis*, *Lin.*, and some others, have been occasionally employed in medicine, on account of their slightly bitter and subastringent qualities, but they do not appear to be of any importance. As to common Vervain, its virtues, great as their reputation has been, are apparently imaginary. The drupeaceous fruits of some species are eatable, as for example those of *Lantanas*, and *Premna esculenta*. But others are very acrid. Those of *Vitex trifolia* are called in India *Filfil burree*, or *Wild Pepper*; those of *Vitex Negundo* resemble them, and *Vitex Agnus castus*, *Lin.*, has similar acrid fruit. According to Forskahl, the seeds are reputed at Smyrna to be a certain remedy against colic, if powdered and strewed over half an Onion applied to the stomach. By far the most interesting plant, however, belonging to the Order of Verbenes is the Teak, *Tectona grandis*. This is an enormous tree, with deciduous leaves, covered with rough points. It inhabits the forests of the mountainous parts of Malabar, Pegu, and other districts in the East Indies. Its timber abounds in particles of silex, and has no rival in Asia for durability. With much the appearance of coarse mahogany it is lighter, and very strong. For ship-building it is perhaps the best in the world. Roxburgh says that its wood is the only useful part of it; but Endlicher states that its flowers are diuretic, that its foliage supplies a red dye, and that a decoction of it is employed by the Malays in cholera, &c.

In De Candolle's *Prodr.* XI. 524, Mr. Schauer gives the following amended list of

#### GENERA.

##### § 1. VERBENÆÆ.

*Spielmannia*, L.  
*Offia*, Adans.  
*Monochilus*, Fisch.  
*Casselia*, Nees.  
*Tamonea*, Aubl.  
*Ghinia*, Schreb.  
*Leptocarpus*, W.  
*Kempferia*, Houst.  
*Ischnia*, DC.  
*Mallophora*, Endl.  
*Chloanthes*, R. Br.  
*Priva*, Adans.  
*Blairia*, Gærtn.  
*Tortula*, Roxb.  
*Streptium*, Roxb.  
*Castelia*, Cavan.  
*Dipyrena*, Hook.  
*Wilsonia*, Hook.  
*Verbena*, L.  
*Glandularia*, J. F. Gmel.  
*Billardiera*, Moench.  
*Shuttleworthia*, Meisn.  
*Uvarovia*, Bunge.  
*Bouchea*, Cham.  
*Chascanum*, E. Mey.  
*Pleurostigma*, Hochst.  
*Stachytarpha*, Vahl.  
*Abena*, Neck.

*Cymburus*, Salisb.  
*Melanthus*, Pohl.  
*Lippia*, L.  
*Dipterocalyx*, Cham.  
*Zapania*, Scop.  
*Bertolonia*, Raf.  
*Platonia*, Raf.  
*Riedelia*, Cham.  
*Cryptocalyx*, Benth.  
*Aloysia*, Orteg.  
*Lantana*, L.  
*Camnara*, Plum.  
*Charachera*, Forsk.  
*Citharexylum*, L.  
*Rauwolfia*, R. & P.  
*Pöppigia*, Bert.  
*Duranta*, L.  
*Ellisia*, P. Br.  
*Castorea*, Plum.  
*Petrea*, Houston.

##### § 2. VITICÆÆ.

*Symphorema*, Roxb.  
*Analectis*, Juss.  
*Sphenodesma*, Jack.  
*Vitacestrum*, Presl.  
*Adelosa*, Bl.  
*Congea*, Roxb.  
*Roseoa*, Roxb.  
*Calochlamys*, Presl.

*Caryopteris*, Bunge.  
*Barbula*, Lour.  
*Mastacanthus*, Endl.  
*Glossocarya*, Wall.  
*Hymenopyramis*, Wall.  
*Peronema*, Jack.  
*Pityrodia*, R. Br.  
*Tectona*, L.  
*Theka*, Rheede.  
*Jatus*, Rumph.  
*Premna*, L.  
*Cornuta*, Burm.  
*Gumira*, Rumph.  
*Holochiloma*, Hochst.  
*Petitia*, Jacq.  
*Callicarpa*, L.  
*Burchardia*, Duham.  
*Johnsonia*, Catesb.  
*Sphondylococcum*, Mit.  
*Porphyra*, Lour.  
*Gewisia*, Blume.  
*Egiphila*, Jacq.  
*Manabca*, Aubl.  
*Omphalococca*, W.  
*Volkameria*, L.  
*Duglassia*, Houst.  
*Clerodendron*, L.  
*Agricola*, Schrk.  
*Siphonanthus*, L.  
*Orida*, L.  
*Faldia*, Plum.  
*Torreya*, Spreng.  
*Cornacachinia*, Savi.  
*Cyclonema*, Hochst.  
*Spironema*, Hochst.  
*Oxera*, Lab.  
*Oncomia*, Spreng.  
*Amasonia*, L. f.  
*Taligalea*, Aubl.  
*Gmelina*, L.  
*Michelia*, Amm.  
*Cornutia*, Plum.  
*Hosta*, Jacq.  
*Vitex*, L.  
*Wallrothia*, Roth.  
*Limia*, Vand.  
*Nephrandra*, Cothen.  
*Psilogyne*, DC.  
*Chrysomallum*, Thouars.  
*Pyrostoma*, F.W. Meyer.  
*Cesarettoa*, Walp.  
*Teucrium*, Hook. fil.  
*Holmskioldia*, Retz.  
*Hastinia*, Sm.  
*Platunium*, Juss.

*Quoya*, Gaud.  
*Hemigymnia*, Griff.  
*Sclerobon*, Benth.  
*Patagonula*, L.  
*Cochranea*, Miers.

NUMBERS. GEN. 45. Sp. 663.

*Olacææ.*

POSITION.—Lamiacææ.—VERBENACEÆ.—Myoporacææ.

*Scrophulariacææ.*



ORDER CCLVII. MYOPORACEÆ.—MYOPORACEÆ.

Myoporinae, R. Brown Prodr. 114. 1810. *Leaves, and fruit*.—*Leaves*, opposite, sessile, or petioled, entire, or serrate, p. 202.—*Avicennia*, Linn. spec. 110.

DIAGNOSIS.—*Echial Europæa*, with *Avicennia myrsinoides* (with flowers), *Myoporum laetifolium*, *Leaves*, and 2-seeded fruit.

Shrubs, with scarcely any pubescence. Leaves simple, without stipules, alternate or opposite, sometimes thickly occupied by transparent cysts. Flowers axillary, rather bracts. Calyx 5-parted, persistent. Corolla 4-lobed, tubular, hypogynous, nearly equal or 2-lipped. Stamens 4, didymous, with sometimes the rudiment of a fifth one, which occasionally bears pollen. Ovary 2- or 4-celled, the cells 1- or 2-seeded, with pendulous ovules; style 1; stigma scarcely divided. Fruit a drupe, with a 2- or 4-celled pericarp, the cells of which are 1- or 2-seeded. Seeds pendulous; embryo taper, in the axis of a small quantity of albumen, or without any; radicle superior.

The principal characters in the fructification of this Order, by which it is distinguished from Verbenæ, are the presence of albumen in the ripe seed, and the direction of the embryo, whose radicle always points towards the apex of the fruit. The first of these characters is, however, not absolute, and neither of them can be ascertained before the ripening of the seed.—R. Brown in *Flinders*, 557. Mr. Bentham is disposed to unite the two.

This Order, with the exception of *Bontia*, a genus of equinoctial America, and of the species of *Myoporum*, found in the Sandwich Islands, has hitherto been observed only in the southern hemisphere, and yet neither in South Africa nor in South America beyond the tropics. Its maximum is evidently in the principal parallel of Terra Australis, in every part of which it exists; in the more southern parts of New Holland, and even in Van Diemens Island, it is more frequent than within the tropics.—R. Brown in *Flinders*, 567. The *Avicennias* are shore trees living like Mangroves in

salt swamps. Their creeping roots, often curving for the space of six feet above the mud before they stick into it, and the naked Asparagus-like scapes which they throw up, have a singular appearance.

The bark of *Avicennia tomentosa*, the White Mangrove of Brazil, is in great use at Rio Janeiro for tanning. It exudes a kind of green acrid resin, which furnishes miserable food to the barbarous natives of New Zealand, who call it *Muramoo*. Arabian writers believe that its saline mucilaginous root is an aphrodisiac. The scaly bark are used in India for poultices; and, when ripe, are boiled and served by the natives.

GENERA.

Myoporum, Banks & Sol.	Species three, 1. <i>Myoporum laetifolium</i> , L.f.	1. <i>Myoporum laetifolium</i> , L.f.	1. <i>Myoporum laetifolium</i> , L.f.
<i>Myoporum</i> , Andr.	<i>Myoporum laetifolium</i> , R. Br.	2. <i>Myoporum laetifolium</i> , R. Br.	2. <i>Myoporum laetifolium</i> , R. Br.
<i>Avicennia</i> , Vent.	<i>Avicennia myrsinoides</i> , L.f.	3. <i>Avicennia myrsinoides</i> , L.f.	3. <i>Avicennia myrsinoides</i> , L.f.
<i>Bontia</i> , Linn.	<i>Bontia myrsinoides</i> , R. Br.	4. <i>Bontia myrsinoides</i> , R. Br.	4. <i>Bontia myrsinoides</i> , R. Br.
<i>Desmantha</i> , F. & M.	<i>Desmantha myrsinoides</i> , L.f.	5. <i>Desmantha myrsinoides</i> , L.f.	5. <i>Desmantha myrsinoides</i> , L.f.
<i>Pholidia</i> , R. Br.	<i>Pholidia myrsinoides</i> , L.f.	6. <i>Pholidia myrsinoides</i> , L.f.	6. <i>Pholidia myrsinoides</i> , L.f.

NUMBERS. GEN. 3. Sp. 12.

POSITION.

POSITION.—Verbenæa & Myoporaceæ.

Fig. CCCXLIII. *Pholidia myrsinoides*. 1. A single flower; 2. A single fruit; 3. Cross section of it; 4. Longitudinal section of a seed.



## ORDER CCLVIII. SELAGINACEÆ.—SELAGIDS.

Selaginæ, *Juss. Ann. Mus.* 7. 71. (1806); *Richard in Pers. Synops.* 2. 146; *Choisy Mémoire*, (1823); *Bartl. Ord. Nat.* 177; *Endl. Gen.* exl.; *E. Meyer, Comment. pl. Afr. Austr.* 245; *Meisner Gen.* p. 292.—*Globularinæ, DC. Fl. Fr.* 3. 427. (1815); *Combessédes in Ann. des Sciences*, 9. 15; *Endl. Gen.* cxxxix.; *Link Handb.* 1. 675; *Meisner*, p. 315.

DIAGNOSIS.—*Echial Exogens*, with irregular unsymmetrical flowers, confluent nuts, pendulous ovules, and 1-celled anthers.

Herbaceous plants, or small branched shrubs. Leaves alternate, generally sessile, toothed, or entire, without stipules, usually in clusters. Flowers sessile, spiked, with large bracts. Calyx spatulate, or tubular, persistent, with a definite number of teeth or divisions, rarely consisting of two sepals. Corolla tubular, hypogynous, more or less irregular, with 5 lobes, imbricated in æstivation. Stamens 4, usually didynamous, arising from the top of the tube of the corolla, seldom 2; anthers 1-celled, usually adnate to the dilated top of the filament, rarely versatile. Ovary superior; style 1, filiform; stigma nearly capitate; ovules solitary, pendulous, anatropal. Disk hypogynous, fleshy. Fruit 2-celled; the cells

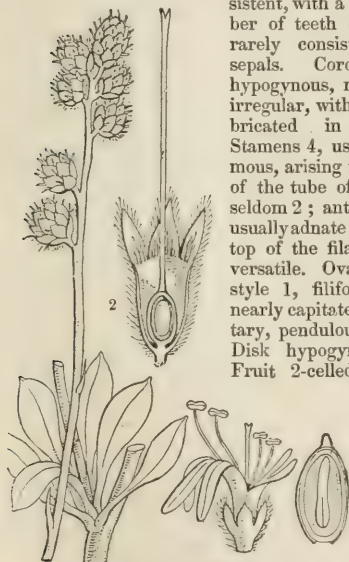


Fig. CCCCXLIV.

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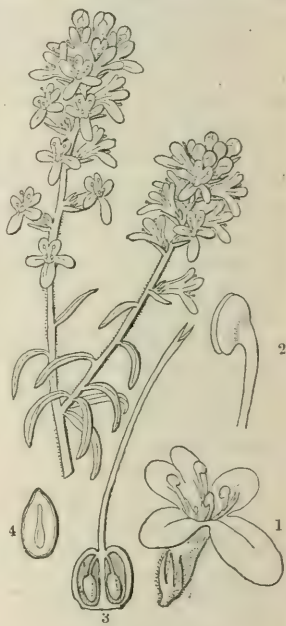


Fig. CCCCXLV.

either separable or inseparable, 1-seeded, membranous. Seed solitary, pendulous; embryo in the axis of a little fleshy albumen; radicle superior.

The very small group collected under the name of Selagids is nearly allied on the one hand to Verbenes, and the other to Myoporads, from both which it is known by having 1-celled anthers. It also differs from Verbenes in having pendulous ovules. Globularia, which has been regarded as the type of a particular Order, does not seem to differ in anything more than having a solitary carpel; for its anthers are 1-celled. The resemblance of that genus to Primworts is very inconsiderable; but it may be regarded as being more like a form of Teazelworts (Dipsacaceæ), with a superior ovary. The genus Globularia is moreover in some respects analogous to Brunonia, which however differs abundantly in having hypogynous stamens, symmetrical flowers, and no albumen.

The principal part of this Order comes from the Cape of Good Hope; Gymnandra is however Siberian, and the Globularias European, chiefly inhabiting the southern kingdoms and the basin of the Mediterranean.

The species seem to be of small importance. Some are sweet-scented; Hebenstreitia dentata is said to be scentless in the morning, strong-smelling at mid-day, and sweet in the evening. Globularia Alpyum is a bitter, drastic purgative, once supposed to be

Fig. CCCCXLIV.—*Globularia orientalis*. 1. a flower; 2. section of calyx and ovary; 3. section of fruit.  
Fig. CCCCXLV.—*Selago distans*. 1. a flower; 2. an anther; 3. a perpendicular section of an ovary; 4. section of seed of *Microdon ovatum*.



the *AAurora* of Dioscorides, and hence called *Fucus hepaticus*. The *Allypud* ~~is known~~  
 had the *oregon* ~~de er. the~~, and was therefore in all probability ~~the~~ *Allypud*. *Clad-*  
*ularia vulgaris* has similar qualities; both are emetic.

## GENERA.

*Polypodium*, *Chenop.*  
*Habenaria*, *Linn.*  
*Dicentra*, *Chenop.*  
*Aristolochia*, *Chenop.*

*Micrantha*, *Chenop.*  
*Isotria*, *Chenop.*  
*Selagin*, *Linn.*  
*Aster*, *Fockl.*

*Mentha*, *F. M.*  
*Waldsteinia*, *F. M.*  
*Gymnocarpus*, *F. M.*  
*Cladonia*, *F. M.*

*Cordylanthus*, *C.*  
*Cladonia*, *F. M.*  
*Cladonia*, *F. M.*

NUMBERS GEN. 10. Sp. 196

POSITION.—Myoporiaceæ.—*Diplopoda*  
*Schizanthus*—*Vincetoxicum*  
*Pseudoliriodendron*



ALLIANCE XLIX. *BIGNONIALES*.—THE BIGNONIAL ALLIANCE.

DIAGNOSIS.—*Perigynous Exogens, with dichlamydeous, monopetalous, unsymmetrical flowers, capsular or berried fruit, having its carpels quite consolidated, parietal free central or axile placentæ, and an embryo with little or no albumen.*

With Bignonials the series of Perigynous Alliances closes, Gesnerworts passing as directly into Bellworts among Campanals as Figworts also pass into the Nightshades among Solanals. The two are parallel instances. Nevertheless, it does not seem expedient to place Gesnerworts at the end of the Bignonial Alliance, because it is impossible to separate them from Bignoniads and Crescentiads, or from Pedaliads, whose hard bony fruit presents the nearest approach in this Alliance to the nuts of Echials. We must, therefore, regard the passage of Bignonials into Campanals as being altogether from the side of the series and not from its extremity. Another lateral affinity presents itself between Butterworts and Primworts, in the Cortusal Alliance. The following will, therefore, express the bearing of Bignonials and other Alliances, better than a lineal position :—

	Pedaliaceæ.	
	Gesneraceæ.	
	Crescentiaceæ.	————— Campanals.
<i>Gentianaceæ.</i> —————	Bignoniaceæ.	
	Acanthaceæ.	
	Scrophulariaceæ.	————— Solanals.
	Lentibulariaceæ.	————— Cortusales.

The Bignonial Alliance may be regarded, then, as the centre of a particular portion of Exogens, round which several others are stationed in nearly equal degrees of contiguity.

## NATURAL ORDERS OF BIGNONIALS.

<i>Placentæ parietal. Fruit bony or capsular. Embryo amygdaloid. Radicle short</i> . . . . .	} 259. PEDALIACEÆ.
<i>Placentæ parietal. Fruit capsular or baccate. Embryo with minute cotyledons. Radicle long</i> . . . . .	} 260. GESNERACEÆ.
<i>Placentæ parietal. Fruit succulent, hard-shelled. Embryo amygdaloid. Radicle short</i> . . . . .	} 261. CRESCENTIACEÆ.
<i>Placentæ axile. Seeds winged, sessile, without albumen. Cotyledons large, leafy</i> . . . . .	} 262. BIGNONIACEÆ.
<i>Placentæ axile. Seeds wingless, attached to hard placental processes, without albumen. Cotyledons large, fleshy</i> . . . . .	} 263. ACANTHACEÆ.
<i>Placentæ axile. Seeds albuminous. Cotyledons scarcely larger than, or not so large as, the radicle</i> . . . . .	} 264. SCROPHULARIACEÆ.
<i>Placentæ free, central. Seeds minute, without albumen. Cotyledons much smaller than the radicle</i> . . . . .	} 265. LENTIBULARIACEÆ.



## ORDER CCLIX. PEDALIACEÆ.—Pedaliniæ.

Pedaliine, *R. Brown Prodr.* 519, 1819. *J. Smith & Brown Botany*, p. 100, 1820. *Endlicher Sesamum, Kienitz Synops.* 2, 261, 1825. *Leavitt, Geol. Nat. Hist. Pennsylvania*, 1833. *Alph. DC. Prodr.* 9, 249; *Berthard in Bot. Soc. Nat. p. 18*, 1835. *Martynia*, *Ann. Bot.* 1, 304, 1829.

DIAGNOSIS.—*Bignonial Euphorbs, with perisperm placenta, four or six-lobed fruit, sometimes dilated endigo, and short radicle.*

Herbaceous plants, often with a soft texture, and heavy smelt, covered with glandular hairs, or quaternary vesicles. Leaves opposite or alternate, undivided, entire, or lobed, without stipules. Flowers axillary, solitary, or clustered, usually large, and furnished in many cases with conspicuous bracts. Calyx divided into 5 nearly equal pieces. Corolla monopetalous, hypogynous, irregular; the throat ventricose, the limb bilabiate, the lobes somewhat valvate in aestivation. Disk hypogynous, fleshy, sometimes glandular. Stamens didynamous, included within the tube, together with a rudiment of a fifth. Anthers 2-celled; the connective articulated with the filament, a little prolonged beyond the cells, terminated by a gland. Ovary seated in a glandular disk, 1-celled, formed of two carpellary leaves, anterior and posterior as regards the axis, sometimes divided into 4 or 6 spurious cells by the splitting of two placentas and the divergence of their lobes; ovules anatropal, either erect, or pendulous, or horizontal, solitary, or 2, or several; style 1; stigma divided. Fruit drupaceous or capsular, valvular, or indehiscent, with from 2 to 6 cells, which are usually few-seeded when numerous, and many-seeded only when two. Seeds with a papery testa, wingless; albumen none; embryo straight; cotyledons large, plano-convex; radicle short, next the hilum.

The only real differences that can be found between these plants and Bignoniads consist in the parietal placentaë of the former, their wingless or nearly wingless seeds, which are in most cases definite, and sometimes in their woody lobed placentaë, which spread and divide variously in the inside of the pericarp, so as to produce an apparently 4- or 6-celled fruit out of a 1-celled ovary. Sesamum may be considered a transition from the one to the other. From Gesneriworts they are readily known by the texture of their fruit, their large seeds, plano-convex cotyledons, and very short radicle. Calabashes are distinguished by their great succulent fruit and almond-like seeds. Endlicher rightly observes that Brown in forming his Pedaliine (*Prodr.* 519), does not combine with them Sesamum; neither, however, does he explain how they are to be distinguished; but as usual, the extreme and studied conciseness of this learned man leaves his reader almost as much in the dark as if the name of Sesamum had not been mentioned.

It is not a little remarkable that such observers as De Candolle (*Prodr.* p. 216) and Endlicher (*Linnaea*, vii. p. 8.) should suppose the fruit of the *Opuntia* to be formed out of 5 or 4 carpels, a statement entirely opposed to both theory and fact. It is truly composed of two anterior and posterior carpels, exactly as that of the other *Opuntia* in the present Alliance. It is doubtless true that Martynia has been described as having



FIG. CCCXLVI.



FIG. CCCXLVII.

Fig. CCCXLVI.—*Sesamum indicum*. 1. a ripe fruit; 2. seed of the same; 3. fruit in section.

Fig. CCCXLVII.—*Martynia lutea*. 1. a flower; 2. the fruit; 3. a cross-section of the fruit.



4 cells ; but so long since as December, 1825 (*Bot. Reg. t. 934*), I explained the true nature of this structure in the following words:—"Upon a careful examination of the ovarium, it will be found that the fruit, in that stage, is neither 4-celled nor even 2-celled, but consists of only one cell, traversed by two projecting, parietal placenta, each of which is 2-lobed ; the lobes divided at right angles from their point of separation, and bearing on their edges a few horizontal ovula, of which part project into the open centre of the ovarium, and the others into the cavity between the placenta and the lining of the ovarium. Now the capsule differs from the ovarium in no essential point of structure, but the following changes take place : the pericarpium and the placentas become woody and rigid, the inner faces of the latter become pressed together so as to destroy the ovula which were placed between them, and to exhibit the appearance of a bilamellar dissepiment, and the remaining ovula become pendulous, and reduced in number, and exist in the form of large apterous seeds between the inner edge of the lateral lobes of the placenta and the endocarpium."

A not less singular in appearance, but unreal deviation, occurs in *Pretrea zanguebarica*, whose two carpels turn their edges inwards, right and left, until they touch the sides of the ovary, and form on each side a little pouch for the reception of the seeds ; at the same time, in consequence of the inflected plates not touching each other, two seedless cavities are also formed next the ventral and dorsal sutures, and thus a six-celled fruit is constructed out of a pair of carpels. The accompanying cut explains this singular structure.

The species of *Pedaliads* occur in all parts of the tropics, in small numbers, but Africa is supposed to be the principal field over which they are spread.

The leaves of *Sesamum* are emollient. Its seeds contain an abundance of a fixed oil, as tasteless as that of Olive Oil, for which it might be substituted, and which is expressed in Egypt in great quantities. It is sometimes called *Gingilie Oil*, and, if of very good quality, is employed for adulterating Oil of Almonds. It is, however, apt to become rancid. The fresh leaf of *Pedaliu Murex*, when agitated in water, renders it mucilaginous, in which state it is prescribed by Indian doctors in cases of dysuria and gonorrhœa. The meal of the seeds of both these plants is used in India for poultices. *Uncaria procumbens*, called the Grapple Plant at the Cape of Good Hope, has a fruit covered with hooked spines, which lay hold of the clothes of travellers, and the pair of long hooked horns of *Martynia proboscidea*, called in Italy the *Testa di Quaglia*, is notorious for the same propensity. The fleshy sweet root of *Craniolaria annua* is preserved in sugar by the Creoles as a delicacy ; in a dry state it is said to be a bitter cooling medicine.

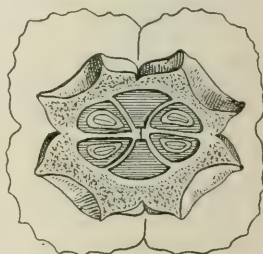


Fig. CCCXLVIII.

#### GENERA.

<b>I. PEDALÆÆ.</b> <i>Craniolaria</i> , Linn. <i>Holoregmia</i> , Nees. <i>? Neowedia</i> , Schrad. <i>Martynia</i> , Linn. <i>Proboscidea</i> , Schmidt. <i>Carpoceras</i> , A. Rich.	<i>Pedaliu</i> , Royen. <i>Cacatali</i> , Adans. <i>Ischnia</i> , DC. <i>Harpagophytum</i> , DC. <i>Uncaria</i> , Burch. <i>Rogeria</i> , Gay. <i>Pretrea</i> , Gay.	<i>Dicerocaryum</i> , Boj. <i>Josephinia</i> , Vent. <i>Pterodiscus</i> , Hooker.  <b>II. SESAMÆÆ.</b> <i>Sesamum</i> , Linn.	<i>Digitalis</i> , Tournef. <i>? Dysosmon</i> , Raf. <i>Ceratotheca</i> , Endl. <i>Sesamopteris</i> , Endl. <i>Gongyla</i> , Bernh. <i>Sporlederz</i> , Bernh.
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NUMBERS. GEN. 14. Sp. 25. ?

POSITION.—*Bignoniaceæ*.—*PEDALIACEÆ*.—*Gesneraceæ*.  
*Selaginaceæ*.

Fig. CCCXLVIII.—*Pretrea zanguebarica* ; a cross section of its fruit.



ORDER CCLX. GESNERACEAE. *Guettarda*

Goswami, R. *Rich. et Juss. Ann. Mus. Nat. Hist. (Paris)* 1843: 1. Type locality: *Inde, Pondicherry*.  
*Ind. Red.* 1110. *Goswami, Ind. Herb.* 1: 14 (1843). *Juss.* *Ann. Mus. Nat. Hist. (Paris)* 1843: 1.  
*Martius Nov. Gen. Rar.* 6: 118. *Engelm. Ann. Bot. (Stromboli)* 1844: 10. *Engelm. Ann. Bot. (Stromboli)* 1844: 10.  
*Wall. Gen. et Cytantheae* 1: 1. *Wall. Bot. Beechey* 1846: 1. *Wall. Bot. Beechey* 1846: 1.  
*Prodr.* 9: 248. *Ed. pr. exalt.* *Dalman, Prodr. Fl. Ind. (Paris)* 1846: 1. *Wall. Bot. Beechey* 1846: 1.

DIAGNOSIS. *Biquinaria Eucypria*, with painful pharynx, suppurative tonsillitis, and large white abscess of the neck, and a lung abscess.

Soft-wooded, somewhat fleshy, herbs or shrubs, occasionally becoming a climbing or creeping manner of growth, and frequently spreading from root, tubercle, or base. Leaves rugose, without stipules, generally opposite or whorled. Flowers showy, in racemes or panicles, rarely solitary, yellow, scarlet, violet, or white. Calyx half adherent, 5-parted, with a valvate or open aestivation. Corolla monopetalous, tubular, more or less irregular, 5-lobed, with an imbricated aestivation. Stamens 2, or 4, didynamous; anthers often cohering, 2-celled, innate, with a thick tumid connective; the rudiment of a fifth stamen is present. Ovary half superior, 1-celled, with 2 fleshy 2-lobed parietal polyspermous placentæ, placed right and left of the axis; surrounded at its base by glands or a fleshy ring; style continuous with the ovary; stigma capitate, concave; ovules 00, anatropal. Fruit capsular or succulent, superior, 1-celled, with 2 opposite lateral placentæ, each consisting of 2 flange. Seeds very numerous, minute; embryo erect, in the axis of fleshy albumen, with the cotyledons much shorter than the radicle; testa thin, with very close fine shagreen, sometimes extended into long hairs, or even flattened into a wing.

These little plants (for they seldom rise above the stature of bushes, and many are mere herbs) have somewhat the appearance of Figworts, or of diminutive *Campanulas*, and have been even referred to those Orders. They, however, differ from all the *Campanulaceae* in the very small size of their cotyledons as compared with the other large ones, and their absolutely parietal placentation; in addition to which they have a great tendency to form an inferior ovary, and thus lead towards the *Campanulaceae* part of the series. To *Eceremocarpus*, a genus of Bignoniads, they approach more nearly, as will be seen by referring to p. 475; but in that plant the winged seeds and the leafy cotyledons point too plainly to Bignoniads to be mistaken. *Hamamelis* still more approach Broomrapes in their parietal placentation.

The Suborder Cyrandreae, usually regarded as a distinct group, has been referred to Gesnerworts by Dr. Brown, and with justice, there being no essential difference between them. (See *Humboldt's Plantes du Venezuela*, p. 106.) It is very remarkable for the long threads that terminate the seeds of certain genera, and the revolute placentae, and in some cases for their long, slender, often curved, styles, which pass into Bignoniads through Incarvillea.

The two sub-orders have a very different geographical distribution. The warm-house plants are common in our gardens, are exclusively indigenous to the tropical or warm parts of America. The *Cyrtandreae*, on the contrary, are spread over a much larger part of the world, although chiefly confined to the eastern parts. Some occur in Europe, as *Trichomanes* and *Haberlea*; others grow in the cooler parts of America, as *Polypodium*, *Habenaria*, and *Klugia* is Mexican, *Streptocarpus* is from the Cape of Good Hope, but it is in the warm valleys of the Himalayas, and in the damp regions of the Andes, *Adiantum*, that they are most abundant, under the terms of *Chloritis*, *Chloritis*, *Chloritis*, and *Didymocarpus*. *Fieldia* is from New Holland, and several *Cyrtandreae* from the South Islands.



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Fig. CCCXLIX.—*Hypercyta gracilis*. A. young 1st instar; B. pupa; C. pupa with its embryo exposed to view; 3. seed with its embryo exposed to view.





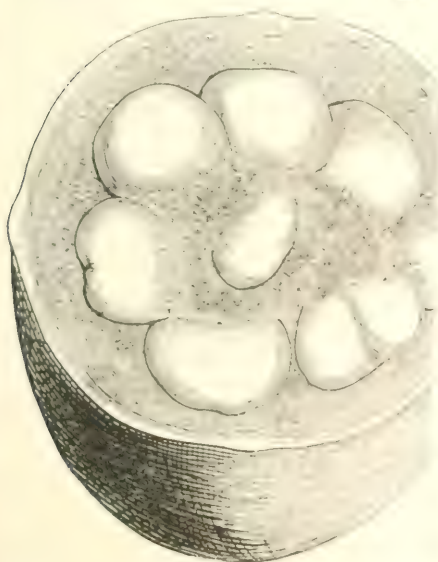


## Oscar O'LEARY CRESCENTIA, Jr. and Mary Ann O'LEARY

[illegible]

DIAGNOSIS.—*U. imbricata* *Leconte*, with partial alitrunk, overcoat blackish-green, legs  
the elongated tibiae with a short setae.

Trees of small size, with alternate or clustered simple leaves without stipules. Flowers growing out of the old stems or branches. Calyx free, undivided, eventually splitting into irregular pieces. Corolla tubeculopetalous, irregular, somewhat 9-ly, pale, with an imbricated aestivation. Stamens 4, growing on the corolla, didynamous, with the rudiment of a fifth between the posterior pair, which are the longest; anthers 2-lobed, bursting longitudinally. Ovary free, surrounded by a yellow annular disk, 1-celled, composed of an anterior and posterior carpellary leaf, with 2 or 4 equidistant paracarpellary centes, which sometimes meet and produce additional cells; ovules 00, horizontal; style 1; stigma of two plates. Fruit woody, not splitting, containing a multitude of large, amygdaloid seeds buried in the pulp of the placenta; skin leathery, house. Embryo straight, without albumen, with plano-convex fleshy cotyledons.



Ex. 00001111

the structure of its calyx, in its four distinct parts.

and a thick, short white coat  
the filly.

[illegible]

Mr. GARDNER then replied to the first of the questions: "In the majority of the South, Christianity is more closely related to the negro than to the white population, but Africa, certainly, there is no historical, well-supported evidence."

Fig. 6.  $\text{CO}_2$  flux =  $0.8 \text{ mg CO}_2 \text{ m}^{-2} \text{ h}^{-1}$  at 1000 ppm  $\text{CO}_2$ .[illegible]



and particularly in habit. The same observations apply to Pedaliaceæ, which are also 1-celled; for although the ripe fruit of both them and Cyrtandraceæ possesses apparently more than one cell, as if produced by the spreading and dividing of their parietal placentæ, the ovary of both, according to Bentham, is always unilocular if examined before the development occasioned by fecundation.

"To all the other Orders of the dicarpous group, Crescentia is of course more or less related, but is abundantly distinct from every one. Thus, it is distinguished from Acanthaceæ by its simple calyx, 1-celled ovary, unsuspended seeds, and in habit; from Lentibulariæ by its parietal, not free central placentation; and from Scrophulariaceæ and Solanaceæ and their allies by its want of albumen."—*Hooker's Journ.* 2. 424.

Inhabitants of the tropics of Asia, Africa, and America, but most especially abundant in the Mauritius and Madagascar.

The principal plant of this Order is the Calabash tree, *Crescentia Cujete*, a tree inhabiting the tropical parts of America, and bearing a great gourd-like fruit, filled with a sub-acid pulp which is eaten by the Negroes, and from which poultices are also prepared; its hard shell is used for holding fluids, in the room of bottles. The pulp of *Tanaecium Jarowa* is applied to the same purposes. *Parmentiera edulis* has fruit like a Cucumber, and affords food to the Mexicans.—*DC.* That of *P. cerifera* more resembles a long candle, whence it is called Palo de Velas. or Candle-tree, in Panama, and is greedily eaten by cattle.—*Seemann.*

#### GENERA.

*Crescentia*, L.  
*Cujete*, Plum.  
*Kigelia*, *DC.*  
*Triplinaria*, Pers.

*Tripinna*, Lour.  
*Sotor*, Fenzl.  
*Schlegelia*, *Miq.*  
*Parmentiera*, *DC.*

*Tanaecium*, Sw.  
*? Jaroba*, Macgr.  
*Schlegelia*, *Miq.*  
*Colea*, Bojer.

*Periblema*, *DC.*  
*Boutonia*, *DC.*  
*Phyllarthron*, *DC.*  
*Arthrophyllum*, Boj.  
*Schlegelia*, *Miq.*

NUMBERS. GEN. 11. Sp. 34.

*Solanaceæ?*

POSITION.—*Gesneraceæ.* — *CRESCENTIACEÆ.* — *Bignoniaceæ.*

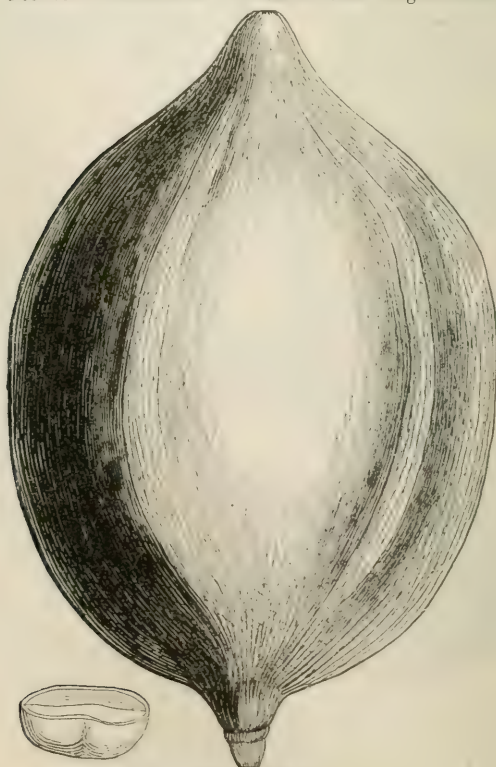


Fig. CCCCLIV.

Fig. CCCCLIV.—*Crescentia cucurbitina*.



## Oxidn. CCLXII. HIGSON &amp; T. J. B. 1950. 1951. 1952. 1953. 1954. 1955. 1956. 1957. 1958. 1959. 1960. 1961. 1962. 1963. 1964. 1965. 1966. 1967. 1968. 1969. 1970. 1971. 1972. 1973. 1974. 1975. 1976. 1977. 1978. 1979. 1980. 1981. 1982. 1983. 1984. 1985. 1986. 1987. 1988. 1989. 1990. 1991. 1992. 1993. 1994. 1995. 1996. 1997. 1998. 1999. 2000. 2001. 2002. 2003. 2004. 2005. 2006. 2007. 2008. 2009. 2010. 2011. 2012. 2013. 2014. 2015. 2016. 2017. 2018. 2019. 2020. 2021. 2022. 2023. 2024. 2025. 2026. 2027. 2028. 2029. 2030. 2031. 2032. 2033. 2034. 2035. 2036. 2037. 2038. 2039. 2040. 2041. 2042. 2043. 2044. 2045. 2046. 2047. 2048. 2049. 2050. 2051. 2052. 2053. 2054. 2055. 2056. 2057. 2058. 2059. 2060. 2061. 2062. 2063. 2064. 2065. 2066. 2067. 2068. 2069. 2070. 2071. 2072. 2073. 2074. 2075. 2076. 2077. 2078. 2079. 2080. 2081. 2082. 2083. 2084. 2085. 2086. 2087. 2088. 2089. 2090. 2091. 2092. 2093. 2094. 2095. 2096. 2097. 2098. 2099. 2100. 2101. 2102. 2103. 2104. 2105. 2106. 2107. 2108. 2109. 2110. 2111. 2112. 2113. 2114. 2115. 2116. 2117. 2118. 2119. 2120. 2121. 2122. 2123. 2124. 2125. 2126. 2127. 2128. 2129. 2130. 2131. 2132. 2133. 2134. 2135. 2136. 2137. 2138. 2139. 2140. 2141. 2142. 2143. 2144. 2145. 2146. 2147. 2148. 2149. 2150. 2151. 2152. 2153. 2154. 2155. 2156. 2157. 2158. 2159. 2160. 2161. 2162. 2163. 2164. 2165. 2166. 2167. 2168. 2169. 2170. 2171. 2172. 2173. 2174. 2175. 2176. 2177. 2178. 2179. 2180. 2181. 2182. 2183. 2184. 2185. 2186. 2187. 2188. 2189. 2190. 2191. 2192. 2193. 2194. 2195. 2196. 2197. 2198. 2199. 2200. 2201. 2202. 2203. 2204. 2205. 2206. 2207. 2208. 2209. 2210. 2211. 2212. 2213. 2214. 2215. 2216. 2217. 2218. 2219. 2220. 2221. 2222. 2223. 2224. 2225. 2226. 2227. 2228. 2229. 2230. 2231. 2232. 2233. 2234. 2235. 2236. 2237. 2238. 2239. 2240. 2241. 2242. 2243. 2244. 2245. 2246. 2247. 2248. 2249. 2250. 2251. 2252. 2253. 2254. 2255. 2256. 2257. 2258. 2259. 2260. 2261. 2262. 2263. 2264. 2265. 2266. 2267. 2268. 2269. 2270. 2271. 2272. 2273. 2274. 2275. 2276. 2277. 2278. 2279. 2280. 2281. 2282. 2283. 2284. 2285. 2286. 2287. 2288. 2289. 2290. 2291. 2292. 2293. 2294. 2295. 2296. 2297. 2298. 2299. 2300. 2301. 2302. 2303. 2304. 2305. 2306. 2307. 2308. 2309. 2310. 2311. 2312. 2313. 2314. 2315. 2316. 2317. 2318. 2319. 2320. 2321. 2322. 2323. 2324. 2325. 2326. 2327. 2328. 2329. 2330. 2331. 2332. 2333. 2334. 2335. 2336. 2337. 2338. 2339. 2340. 2341. 2342. 2343. 2344. 2345. 2346. 2347. 2348. 2349. 2350. 2351. 2352. 2353. 2354. 2355. 2356. 2357. 2358. 2359. 2360. 2361. 2362. 2363. 2364. 2365. 2366. 2367. 2368. 2369. 2370. 2371. 2372. 2373. 2374. 2375. 2376. 2377. 2378. 2379. 2380. 2381. 2382. 2383. 2384. 2385. 2386. 2387. 2388. 2389. 2390. 2391. 2392. 2393. 2394. 2395. 2396. 2397. 2398. 2399. 2400. 2401. 2402. 2403. 2404. 2405. 2406. 2407. 2408. 2409. 2410. 2411. 2412. 2413. 2414. 2415. 2416. 2417. 2418. 2419. 2420. 2421. 2422. 2423. 2424. 2425. 2426. 2427. 2428. 2429. 2430. 2431. 2432. 2433. 2434. 2435. 2436. 2437. 2438. 2439. 2440. 2441. 2442. 2443. 2444. 2445. 2446. 2447. 2448. 2449. 2450. 2451. 2452. 2453. 2454. 2455. 2456. 2457. 2458. 2459. 2460. 2461. 2462. 2463. 2464. 2465. 2466. 2467. 2468. 2469. 2470. 2471. 2472. 2473. 2474. 2475. 2476. 2477. 2478. 2479. 2480. 2481. 2482. 2483. 2484. 2485. 2486. 2487. 2488. 2489. 2490. 2491. 2492. 2493. 2494. 2495. 2496. 2497. 2498. 2499. 2500. 2501. 2502. 2503. 2504. 2505. 2506. 2507. 2508. 2509. 2510. 2511. 2512. 2513. 2514. 2515. 2516. 2517. 2518. 2519. 2520. 2521. 2522. 2523. 2524. 2525. 2526. 2527. 2528. 2529. 2530. 2531. 2532. 2533. 2534. 2535. 2536. 2537. 2538. 2539. 2540. 2541. 2542. 2543. 2544. 2545. 2546. 2547. 2548. 2549. 2550. 2551. 2552. 2553. 2554. 2555. 2556. 2557. 2558. 2559. 2560. 2561. 2562. 2563. 2564. 2565. 2566. 2567. 2568. 2569. 2570. 2571. 2572. 2573. 2574. 2575. 2576. 2577. 2578. 2579. 2580. 2581. 2582. 2583. 2584. 2585. 2586. 2587. 2588. 2589. 2590. 2591. 2592. 2593. 2594. 2595. 2596. 2597. 2598. 2599. 2600. 2601. 2602. 2603. 2604. 2605. 2606. 2607. 2608. 2609. 2610. 2611. 2612. 2613. 2614. 2615. 2616. 2617. 2618. 2619. 2620. 2621. 2622. 2623. 2624. 2625. 2626. 2627. 2628.

Received 14.2.2008; accepted 17.10.2008. Address correspondence to: Dr. J. Hämäläinen, Department of Health Sciences, University of Jyväskylä, P.O. Box 35, FIN-40014 Jyväskylä, Finland. E-mail: jarmo.hamalainen@utu.fi

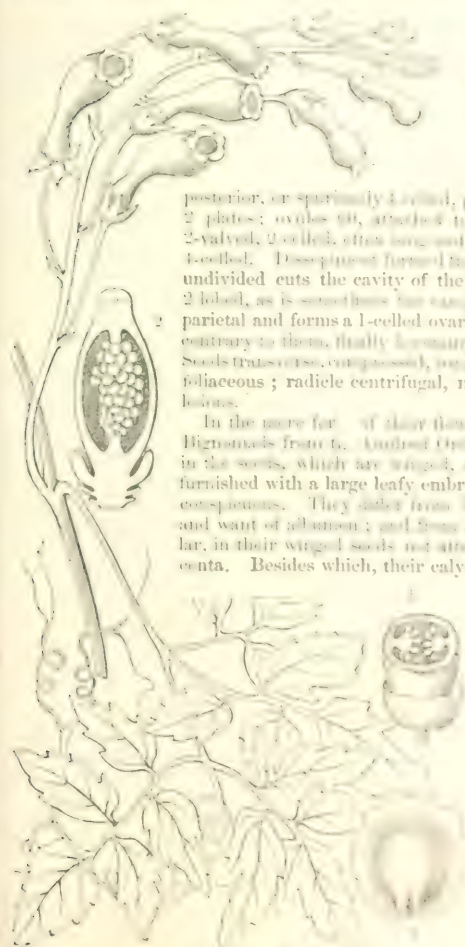
DIAGNOSIS: *E. granulos* (Ergasilus), with mild pleurisy, several small nodules, and 27 mm. (1 inch) from heart to caecum.

Flores, shrubs, or occasionally herbs, often climbing or scandent. Leaves opposite, very rarely alternate, compound or occasionally simple, without stipules. Inflorescence

[illegible]

posterior, or spirally 4-celled, polyserious; seeds 1 or 2; valves 2; ovules 10, attached to a central axis; perisperm 0. 2-celled, 2-celled, often long and compressed; sometimes 3-celled. Development formed in the placenta, which when undivided cuts the cavity of the ovary into 2 cells, or otherwise 2-lobed, as is sometimes the case, leaving the 3rd parietal and forms a 1-celled ovary, either parallel with the valves contrary to them, finally 1-celled, separate and bearing the seeds. Seeds transverse, elongated, angled; albumen 0; endosperm foliaceous; radicle centrifugal, much smaller than the leaf bases.

In the more far-off than flower there is nothing to distinguish *Bignoniads* from the *Androstemon*. The flowers are the largest in the seeds, which are winged, sessile, destitute of albumen, and furnished with a large leafy embryo, whose radicle is small and inconspicuous. They differ from *Euphorbia* in their being winged, and want of albumen; and from *Asclepias*, whose seeds are similar, in their winged seeds not attached to the hard part of the pericarp. Besides which, their calyx is by the fruiting well known to be



F I G U R E 1



an exception, its placenta being spirally rotated at the base of the vagina at one

Fig. CCCLV. — *Eleutherocarpus* sp. — Terminal part of the stem in longitudinal section of 3. seed.

1. CCCCXVI.—Crossed at the end with a small loop, and with a small loop at the end.



flower. I, however, stated long since (*Bot. Reg.* 939, Dec. 1825,) that the placentation of *Eccecremocarpus scaber* and *Bignonia radicans* are originally of the same nature, the difference between them consisting in the two placenta of the latter meeting in the axis and uniting there, while in *Eccecremocarpus* the two placenta never touch in the middle, but exclusively adhere to the edges of the carpels.

Their wood is occasionally subdivided into 4 cruciform lobes. This is very conspicuous in *Bignonia capreolata*, and seems to be general in the woody species. M. Gaudichaud assures us that in Guayaquil these twiners have at first only 4 divisions of their woody system, but afterwards acquire 8, then 16, and probably 32, the divisions regularly following this mathematical progression. He also finds some indication of the tendency in the old stems of *Bignonia capreolata*. See his *Recherches Générales sur l'Organographie*, &c. p. 129, and the figures accompanying the statement.

The tropics of either hemisphere are the chief station of this noble-looking Order, whose trumpet-shaped flowers are the glory of the places which the species inhabit. The Order extends northwards in North America as far as Pennsylvania, and southwards into the southern provinces of Chile. In Europe it is unknown in a wild state.

The species are best known for the great beauty of the flowers, which from their large size, gay colours, and great abundance, are often among the most striking

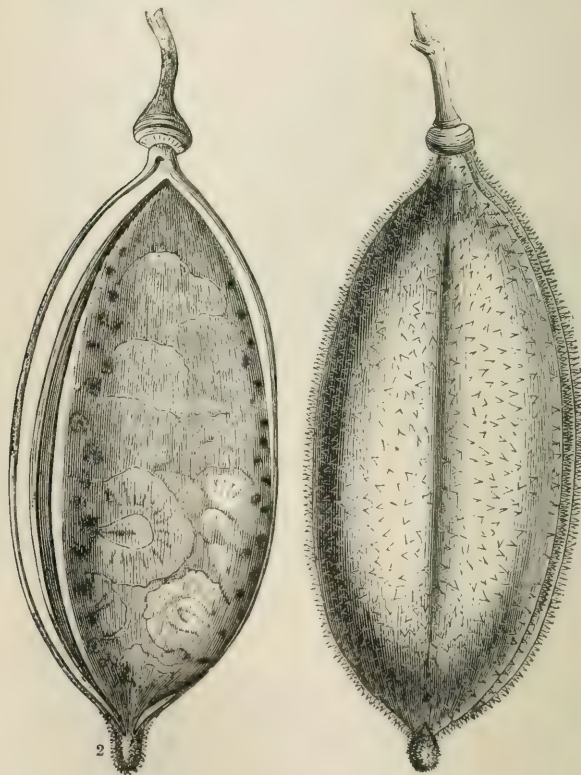


Fig. CCCCLVII.

objects in a tropical forest. Chica (called also Carajuru) is a red feculent substance obtained by boiling the leaves of *Bignonia Chica* in water; the Chica is quickly precipitated by adding some pieces of the bark of an unknown tree, called Arayana; the

Fig. CCCCLVII.—1. capsule of *Bignonia echinata* (*Pithecolobium Aubletii*); 2. the same with the valves removed and the placenta remaining covered with seeds.



Indians use it for painting their bodies red; it renders an artificial impermanence in colour; in nature it approaches the russet, but sometimes assumes purplish greenness, and grows an orange red to cotton. The tough shoots of *B. Chama* are remarkable for hardness. A decoction of the pods of *Catalpa syriaca* is used in India as a remedy for muscular dyspnea and coughs.—*Cham. Med.*, xiii. 233. According to Boissier, a native, almost species, or perhaps the same, found in Japan, has extremely bitter leaves and bark, and a decoction of the pods is employed in a similar manner. Barks are sometimes employed for fumigations. The bark of the younger branches of *B. antiopifolia* is pronounced by Brazil one of the most powerful remedies against syphilitic eruptions of a venereal character. The decoction is chiefly used, and also the bark dried and powdered, occasionally. The roots of some are venomous and bitter; that of *Tecoma stans* is bitter. The bark of *B. leucocylon* is regarded as an antilepro in the parts of the Maracani tree. The branches of *B. ciliolata* are said to be employed in quelling the inflammation. *Tecoma impetiginosa* abounds in tannin; its bark is bitter and emollient, and is used in lotions, baths, &c. in inflammations of the joints and cutis. *Tecoma speciosa* similar qualities, and is prescribed by the Brazilians as a gargle in sores of the mouth; the leaves are milder and are sometimes used in ophthalmic affections. The leaves of *Sparattosperma lithontripica* are bitter, acrid, and diuretic, and have a Brazilian reputation in calculus, in which indeed Martius confirms their efficacy. *Apocynum* species and other species of that genus are employed in syphilitic affections. *Tecoma speciosa* is said to be a useful diuretic and cathartic. Several kinds of Bignoniac Fern Trees grow in the forests of Brazil, where they are valued for the sake of their timber; that called Ipe-tabacco furnishes durable ship-timber; the Ipeuna, another species, is the best timber wood in Brazil. Another, called the Pau d'arco, supplies one of the best kinds of bows used for bows by the Brazilian savages, especially the Tamaras of the Rio Taboas in Belmonte, and the Patachos of the Riacho Prado.

# GENERA.

<i>Bignonia</i> , L.	<i>Arrabidaea</i> , DC.	<i>Stereospermum</i> , Cham.	<i>Tecoma</i> , Benth.
<i>Splachnium</i> , Don.	<i>Pithecellobium</i> , Mart.	<i>Zephania</i> , Benth.	<i>Coccoloba</i> , B. & H.
<i>Tournefortia</i> , Mart.	<i>Amorimia</i> , Mart.	<i>Chama</i> , Schott.	<i>Conocarpus</i> , W. & A.
<i>Alseodaphne</i> , Mart.	<i>Dacryodes</i> , DC.	<i>Calyptranthes</i> , Miqu.	<i>Blumea</i> , Presl.
<i>Batocypdia</i> , Mart.	<i>Haplodaphne</i> , DC.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Pachyptera</i> , DC.	<i>Alseodaphne</i> , DC.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Fridericia</i> , Mart.	<i>Amphipharos</i> , Benth.	<i>Cratogeomys</i> , Hoff.	<i>Alseodaphne</i> , DC.
<i>Asanthus</i> , D. Don.	<i>Pithecellobium</i> , Mart.	<i>Pithecellobium</i> , Mart.	<i>Alseodaphne</i> , DC.
<i>Calosanthus</i> , Benth.	<i>Delonix</i> , P. Presl.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Alseodaphne</i> , Vent.	<i>Cyrtanthus</i> , Mart.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Cuspidaria</i> , DC.	<i>Alseodaphne</i> , Mart.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Leptocarpus</i> , Mart.	<i>Alseodaphne</i> , Mart.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Maclurea</i> , A. D.	<i>Alseodaphne</i> , Mart.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Lundia</i> , DC.	<i>Alseodaphne</i> , Mart.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Manson</i> , DC.	<i>Alseodaphne</i> , Mart.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.
<i>Millingtonia</i> , L.	<i>Alseodaphne</i> , Mart.	<i>Leptocarpus</i> , Lam.	<i>Alseodaphne</i> , DC.

NUMBERS. GEN. 41. Sp. 130.

POSITION.—Gesneriaceæ.—BIGNONIACEÆ.—CROSSOTACEÆ.

The bark of the young branches of *Stereospermum Africanum* reduced to powder and left to dry, is employed in Abyssinia in making dyes. The British physician, or Meier-Deur, is asserted to possess a medicinal quality of the root found here and incredible nature.—See *A. Richard's Flora Abyssinica*, II. 80.

NOTE.—Oxytropis, Presl = Argemone, Hoffm.



## ORDER CCLXIII. ACANTHACEÆ.—ACANTHADS.

*Acanthi*, Juss. Gen. 102. (1789).—Acanthaceæ, R. Br. Prodr. 472; Nees ab. Esenb. in Wall. pl. as. rar. 3. 70; Endl. Gen. cl.; Meisner Gen. p. 293.

DIAGNOSIS.—*Bignonial Exogens, with axile placentæ, wingless exalbuminous seeds attached to hard placental processes, and large fleshy cotyledons.*

Herbaceous plants or shrubs, chiefly tropical; their hairs, if they have any, simple, occasionally capitate, very rarely stellate. Leaves opposite, rarely in fours, without



Fig. CCCCLVIII.

stipules, simple, undivided, entire, or serrated; rarely sinuated, or having a tendency to become lobed, sometimes in unequal pairs. Inflorescence terminal, or axillary, in spikes, racemes, fascicles, or panicles; the flowers sometimes even solitary. Flowers usually opposite in the spikes, sometimes alternate, with three bracts, of which the lateral are now and then deficient; these bracts sometimes large and leafy, and inclosing a diminished calyx, which is occasionally obsolete. Calyx 4- or 5-divided, usually 5-leaved, equal or unequal, generally very much imbricated, occasionally cut into many pieces, or entire and obsolete, persistent. Corolla monopetalous, hypogynous, bearing the stamens, mostly irregular; the limb ringent or 2-lipped (the lower lip overlapping the upper in æstivation), occasionally 1-lipped, sometimes nearly equal, deciduous. Stamens mostly 2, both bearing anthers; sometimes 4, didynamous, the shorter ones being sometimes sterile; anthers either 2-celled, their cells being inserted equally or unequally, or 1-celled, opening lengthwise. Ovary seated in a disk, 2-celled, composed of 2 carpels placed in front and back as regards the axis, and bearing the placentæ on their edges, the cells either 2- or many-seeded; placentæ parietal, although adhering in the axis; style 1; stigma 2-lobed, rarely undivided; ovules amphitropal or campulitropal. Capsule 2-celled, the cells 2- or many-seeded, often contracted into a stalk by the abortion of the base, and sometimes even 1-seeded, bursting elastically with 2 valves. Dissepiment opposite the valves, separating into two pieces through the axis (the middle being sometimes open); these pieces attached to the valves, sometimes separating from them with elasticity; entire, or occasionally spontaneously splitting in two, their inner edge bearing the seeds. Seeds roundish, hanging by hard, cup-shaped, or usually hooked ascending processes of the placenta; testa loose; albumen 0; embryo curved or straight; cotyledons large, roundish; radicle taper, descending, and at the same time centripetal, curved, or straight.

In a majority of cases these plants are to be recognised by the presence of large leafy bracts, in the axils of which the flowers are concealed, and also by their calyx being composed of deeply imbricated sepals forming quite a broken whorl. But their most exact difference from the other Orders of the Alliance consists in the singular structure of their placenta, which expands into hard woody processes, which are most commonly hooked. In the form of their embryo they agree with Bignoniads, but the cotyledons are more fleshy, and their seeds are never winged. From Figworts they are absolutely divided by the absence of albumen, as well as by their placental processes and large fleshy cotyledons. A singular want of development occurs in the calyx of the genera *Thunbergia*, *Mendozia*, and *Clistax*, in which that organ is sometimes reduced to a mere obsolete ring, its place being supplied by bracts. *Mendozia* is also remarkable for its fruit being a 1-seeded drupe, with crumpled chrysaloid cotyledons. Mr. Bentham states that the placental processes are sometimes absent; in such cases the embryo can be alone relied upon.



An elaborate account of this Order has been published by Professor W. L. Brown in his Dissertation upon the Indian Genera of Dr. Walpolean's Hieracium of the last year quoted. It is there that the mode of growing, the first growth, the structure of the root, and a natural arrangement of these genera are given. This natural becomes artificial in Dr. Brown, that among Acauthoids the most valuable of all characters is based on placental processes, and according to his theory, great others are derived from : I. The *longitudinal* Processes expanded into a hairy cap and white in the male, which they support. II. *Nodular* Processes contracted into a papilla which bears two columns of seeds. Seeds small and pitted. III. *Zonular* Seeds supported by hooked processes. The subordinate divisions are formed upon a structure connected with the base of the corolla, the number of stamens, the condition of the anther, &c. and now he differs widely from Dr. Brown in his estimate of the relative value of characters. A new arrangement has been since proposed by Professor Murray, who attributes a importance to the placental processes, and adds two tribes called Rosagenerae and Hespero-. He truly observes that there are few natural Orders which more demand a re-consideration; a searching investigation as that of Acauthoids. Professor Murray has chiefly occupied himself with Indian species : but the crowded African and American which load the shelves of all large herbaria, must be well & proportioned for them to bear to the whole of the Order.

Professor Nees & Eschschek entertains the opinion that the fruit of *Arctostaphylos* consists of 4 carpels, alternate with the sepals, a fifth, answering to the space between the lower sepals, being constantly deficient. He says that their union is so loosely covered when they are very young, and that each has its own ostiole and three veins at its base; he compares these carpels to the laminae of *Arctostaphylos*; he states that the placentae of the upper carpillary leaves and of the lower edge of the lower, are constantly imperfect.—*Hortus Tyb.* 4. Nov. 1836.

Acanthads are almost entirely tropical, and in such regions are much commoner, constituting in fact a large part of the woody herbage. It is only in some rare instances that they advance far to the north, as in the genus *Argemone* found in Illinois, and in a few species inhabiting the United States.

They are of very slender importance to him. The greater part are here weeds; many, however, are plants of great beauty, especially the species of *diandra*, *Salicodendron*, and *Ruellia*. For the most part they are innocuous and slightly bitter; occasionally the bitterness increases, and they become pectoral medicines; others are found plants. The genuine *Acanthus*, formerly called *fraxinifolius*, whose beautifully broad and sinuated leaves furnished the noble ornament of the Corinthian capital, and which, as *Antistes tyrocinus* is a European plant. The flowers have a blue tinge of *Adiantum* are fetid, somewhat, and said to be antispasmodic. Its *Centropogon* pectoralis, called *muscar*, yields a sweet-scented syrup, which is considered as detending a stomachic. The leaves and stalks of *Gentiana* tropical have their reddish, a strong and not unpleasant smell, and are, after being washed previous in India in cases of chronic rheumatism, attended with sweating to the skin. The basis of a famous French bitter tincture, called *Dring*, and is highly valued for its stomachic and tonic properties, is the *Andropogon paniculatus*, called *capra* in India. The leaves of *Dipterocarpus* are said to be antispasmodic, *Democarpus* is one of the diuretics. A valuable deep-red dye, called *Frang*, is obtained in America from a species of *Ruellia*. *Gambel's Journal*, &c. 8. May 1846.

The Order has been reannounced by Noes in  $D \setminus C = \bar{P} \cup \bar{P}^c$ . NT

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[illegible]



*Phayloopsis*, W.  
*Teliostachya*, Nees.

## § 6. ACANTHÆÆ.

*Blepharis*, Juss.  
*Dilivaria*, Juss.  
*Acanthus*, L.  
*Cheilopsis*, Moq. Tand.  
*Acanthodium*, Del.  
*Blepharacanthus*, Nees.  
*Acanthopsis*, Harvey.  
*Isacanthus*, Nees.  
*Sclerochiton*, Harv.

## § 7. APHELANDRÆÆ.

*Crossandra*, Salisb.  
*Harrachia*, Jasq.  
*Stenandrium*, Nees.  
*Caldenbachia*, Pohl.  
*Polythrix*, Nees.  
*Holzendorffia*, Karsten.  
*Geissomeria*, Lindl.  
*Salpixinantha*, Hook.  
*Lagochilum*, Nees.  
*Strobilorachis*, Link.  
*Aphelandra*, R. Br.  
*Synandra*, Schrad.  
*Hemitome*, Nees.  
*Hemisandra*, Scheidw.

## § 8. GENDARUSSEÆ.

*Spirostigma*, Nees.  
*Mackenzia*, Nees.  
*Haplanthera*, Hochst.  
*Ruttia*, Harv.  
*Ramusia*, Nees.  
*Monotheicum*, Hochst.  
*Stenostephanus*, Nees.  
*Galeottia*, Nees.  
*Anthocometes*, Nees.  
*Habracanthus*, Nees.  
*Holographis*, Nees.  
*Sebastiano-Schaueria*,  
Nees.

*Chætothylax*, Nees.  
*Heinzelia*, Nees.  
*Schaueria*, Nees.  
*Pachystachys*, Nees.  
*Phlogacanthus*, Nees.  
*Loxanthus*, Nees.  
*Duvernoia*, E. Mey.  
*Thysracanthus*, Nees.  
*Odontonema*, Nees.  
*Graptophyllum*, Nees.  
*Cyrtanthera*, Nees.  
*Hoverdenia*, Nees.  
*Cardiacanthus*, Nees.  
*Jacobinia*, Nees.  
*Harpochilus*, Nees.  
*Drejera*, Nees.  
*Plagiacanthus*, Nees.

*Rhytglossa*, Nees.  
*Amphiscopia*, Nees.  
*Orthotactus*, Nees.  
*Sericographis*, Nees.  
*Herpetacanthus*, Nees.  
*Schultzia*, Nees.  
*Hemichoriste*, Nees.  
*Anisostachya*, Nees.  
*Rostellaria*, Rehb.  
*Leptostachya*, Nees.  
*Campylostemon*, E. Mey.  
*Sarotheca*, Nees.  
*Schwabea*, Endl.  
*Pogonospermum*, Hoch.  
*Adhatoda*, Nees.  
*Tyloglossa*, Hochst.  
*Athlicanthus*, Endl.  
*Amblyanthus*, Nees.  
*Gendarussa*, Rumph.  
*Monechma*, Hochst.  
*Simonisia*, Nees.  
*Beloperone*, Nees.  
*Anisotes*, Nees.

## § 9. ERANTHEMÆÆ.

*Justicia*, L.  
*Rhinacanthus*, Nees.  
*Sericospora*, Nees.  
*Anisacanthus*, Nees.  
*Eranthemum*, L.

*Lankesteria*, Lindl.  
*Chameranthemum*, Nees.  
*Anthacanthus*, Nees.  
*Chætacanthus*, Nees.

## § 10. DICLIPTERÆÆ.

*Pentstemonacanthus*,  
Nees.  
*Blechum*, P. Br.  
*Tetramerium*, Nees.  
*Rungia*, Nees.  
*Dicliptera*, Juss.  
*Dianthera*, Soland.  
*Henrya*, Nees.  
*Brochosiphon*, Nees.  
*Peristrophe*, Nees.  
*Raphidospora*, Nees.  
*Hypoestes*, R. Br.  
*Lasiocladus*, Bojer.  
*Brachystephanus*, Nees.  
*Clinacanthus*, Nees.

§ 11. ANDROGRAPHI-  
DÆÆ.

*Haplanthus*, Nees.  
*Eranthera*, Wall.  
*Andrographis*, Wall.  
*Gutzlafia*, Hance.

NUMBERS. GEN. 155. Sp. 1450.

*Verbenacæ.*

POSITION.—Bignoniaceæ.—ACANTHACEÆ.—Scrophulariaceæ.



Fig. CCCCLIX.

Fig. CCCCLIX.—*Aphelandra cristata*.—Paxton.







pulvinate mass in the fork. Fruit capsular, seldom berried, dicarpellary, 2-celled sometimes with 2 entire or bifid valves, sometimes with 4 entire ones, sometimes opening by pores or lids, very rarely almost indehiscent; dissepiment parallel or opposite to the valves, finally loose in the centre, or altogether. Placentæ adhering to the dissepiment, sometimes when mature separate and forming 1-2 central columns. Seeds indefinite, rarely definite, albuminous; embryo orthotropal, heterotropal, or antitropal, but slightly curved.—*Bentham*.

The capsular monopetalous genera of Dicotyledons, with a superior ovary, albuminous seeds, and irregular diandrous or didynamous stamens, were separated by Jussieu into two Orders, which he called *Scrophulariæ* and *Pedicularæ*, distinguished from each other by the dehiscence of their fruit: the former being septicidal, and the latter loculicidal. Brown, in his *Prodromus*, pointed out the insufficiency of this character, which is often not even of generic value, and he combined the Orders of Jussieu under the common name of *Scrophularinæ* (Figworts). This opinion has been adopted by subsequent writers, with the exception of De Candolle, who, in Duby's *Botanicon Gallicon* (1828) adheres to the old division of Jussieu, the names being changed into *Antirrhinæ* and *Rhinanthaceæ*. Notwithstanding the almost universal assent to the identity of the two Orders of Jussieu, some separations have been made upon different principles from those of that learned Botanist. Thus Broomrapes have been distinguished by himself; Gesnerworts by Nees Von Esenbeck; and Melampyraceæ by Richard. The two former are adopted by all Botanists; the latter group has not been generally received. I formerly admitted it, upon the ground of its definite ascending seeds and inverted embryo; but subsequent observation led me to think that by excluding from the character all consideration of the number and direction of the seeds, an Order would be formed, agreeing in a peculiar habit, and in the radicle of the embryo not being presented to the hilum, to which the name of *Rhinanthis* might conveniently be retained. According to this view of the subject, Figworts would include no genus the embryo of which is not orthotropal, and in *Rhinanthis* it could be antitropal or heterotropal. But although the attachment of the seeds of *Rhinanthis* is generally lateral, yet sometimes the radicle points to the hilum; but it is more generally removed from it. The ovules are never fewer than 2 in each cell, often numerous, and there are sometimes, though rarely, 2 ovules only in the ovary of some of the tribes of Figworts. And therefore the ground for separating *Rhinanthis* from Figworts sinks from under us.

The number of synonymous names above quoted, shows into how many more supposed Orders the old *Scrophulariæ* have been broken by one author or another. The whole matter has, however, been investigated by Mr. Bentham, who has treated the question in both a philosophical and practical way, and who concludes that in fact all the supposed Orders are really sections of one great Natural Order.

Mr. Bentham remarks that the nearest Order to Figworts is undoubtedly that of Nightshades, through the medium of Salpiglossids; so that it becomes necessary to separate them by a purely artificial distinction, considering as Nightshades such genera as have a plaited corolla and 5 stamens, and as Figworts all those in which either the fifth stamen is wanting, or the æstivation of the corolla imbricated. The line would thus be drawn between *Petunia* and *Salpiglossis*, two genera closely allied in habit. In the first, however, the decidedly plicate corolla and 5 stamens show it to be a true Nightshade, whilst the slight irregularity of the corolla and the declinate very unequal stamens, indicate an approach to *Salpiglossis*, which, being always didynamous, with an imbricately æstivating, or obscurely plicate corolla, is a genuine Figwort. Among Verbasceæ the genus *Verbascum* which is pentandrous, and *Celsia*, because it cannot be separated from *Verbascum*, have usually been referred to Nightshades, although no plants nearly allied to *Verbascum* occur in the latter Order; but the æstivation of the corolla, besides the general habit, leave no doubt that Bartling and others are right in classing these genera among Figworts. A better reason seems to me to be furnished by the manifest tendency to lose a part of the stamens, which occurs in *Verbascum*.

From the other Orders of this Alliance the Figworts are sufficiently well distinguished. They differ from Pedaliads, Gesnerworts, and Crescentiads in their placenta never being parietal; from Bignoniads and Acanthads in their albuminous seeds and small cotyledons; from Butterworts in their axile, not free central placentæ.

Some Figworts approach Broomrapes in the peculiar habit of that Order, especially the *Buchnerææ*, among which most, if not all, the *Strigas* are parasitical, and *Buchnera hydrabadensis* is actually leafless like a Broomrape.

The two tribes of *Mitrasacmeæ* and *Buddleæ* approach *Loganiads* in their leaves being connected by a transverse line, which occasionally expands in the form of stipules; but they differ in their flowers being irregular, at least in æstivation, one lateral lobe being outermost, whilst the upper one is innermost. In all *Loganiads* which I have examined, the æstivation is either regularly convolute or valvate. The irre-



gularity of the corolla sometimes assumes a very peculiar appearance, owing to the tendency to form pouches or spurs. This is particularly striking in the genus *Ipomoea* and *Antirrhinum*, in which the corolla takes a diversity of forms, as in *ip.* *sp.* there is convexity on the upper side of the limb, the result of which is that there is a pocket called *ringet*; and also a depression downwards, which produces a long spur. In the genus *Calceolaria* it causes the calycary base to assume quite the appearance of a slipper. On the other hand, in the genus *Verbena*, both irregularity and want of symmetry almost wholly disappear.



FIG. CCCCLXI.

In this Order many species have a stigma composed of two highly sensitive plates, one placed next the back and the other next the front of the flower. When the female first expands, these plates stand apart and are soon turned back, allowing the pollen to be touched; they collapse suddenly and with some times. This phenomenon has been described by Mr. Henderson in the *Journal of Nat. Hist.* vol. 6, p. 51.

A curious genus, called *Scheweria*, with clavate glands growing from the adjacent parts of its corolla, usually referred to this Order, was formerly rejected as my mistake, the stamens having appeared to me to be opposite the lobes of the corolla. It is more than twenty years since I had an opportunity of examining it, and Mr. Hooker now assures me that the real petals are the adaxial glands with which the stamens alternate, and that it is a genuine member of the Order of L. exerts.

These plants are found in abundance in all parts of the world, from the polar regions, in which the vegetation of flowering plants takes place, to the hottest places within the tropics. One species is found in Melville Island; in the middle of Europe there are about a 26th of the flowering plants, and in North America about 6, 100. In all India, New Holland, and South America they are common; and, finally, the whole islands of Tierra del Fuego are ornamented with several genera.

The species are generally acrid, bitterish, and suspected. The leaves and roots of *Scrophularia aquatica*, and perhaps *nodosa*, some species of *Cassipourea* and many others, act as purgatives, or even as emetics. In *Digitalis purpurea*, which has been long used as a purgative, and other species, this quality is so much increased, that its effects become highly dangerous; the powdered leaves, or an extract of them, produce vomiting, purgation, and vertigo, increase the secretion of the saliva and urine, lower the pulse, and sometimes cause death. The Mulleins approach *Digitalis* in this respect; the seeds of *Veronica*, *Thapsus* and *nigra* are used by poachers to poison fish, and the leaves of *E. Toxicaria* are sometimes used to destroy mice; the foliage of these plants is acrid and bitterish. The leaves of *Mimulus guttatus* are eatable as salad. The juice of the leaves of *Torenia asiatica* are considered, on the Malabar coast, a sure cure for leprosy. An infusion of *Scoparia dulcis* is used by the Indians of Spanish America to cure agues, and in Brazil against hæmorrhoidal affections. *Euphorbia affinis* is highly valued for its aromatic, and has been employed with success by Kramichfield in hæmorrhoidal affections of the eye; he has also found it beneficial in cough, flatulency, venereal and gonorrhœa, which have supervened in catarrhal affections. — *Merc. lib. v. 1. c. 1.* Others are said to be fond of *Melantherum pratense*; and *Lernæum* with the root and yellow butter is made where it abounds. The Pedicularids are acrid, but less so than the others. Nearly all that tribe turn black in drying. *Herposiphys* affinis, of Indian origin, is extremely bitter; but its properties have not been investigated. *Piscaria* derives its name from the bitterness of its roots; it is used on that account in the vulgar medicine of India. *Vandellia diffusa* is said to be of great value in Gambia, as an antiseptic agent.

FIG. CCCCLXI. — 1. Slipper-shaped corolla of *Cypripedium*; 2. spurred corolla of *Linaria*; 3. bell-shaped and spurred corolla of *Linaria*.



and febrifuge, and a most efficacious remedy in malignant fevers and dysentery, especially in cases depending on a disordered state of the liver. It is called Haimarada by the Arowak Indians, and Bitter Blain by the Dutch Creoles. *Linaria vulgaris* is reputed to be purgative and diuretic. It is bitter. Its flowers have been recommended in decoction as a wash for chronic diseases of the skin; and that it would not be an inactive lotion seems probable from the fact that in London the plant is occasionally boiled in milk for the purpose of destroying flies. *Linaria cymbalaria* has a warm cress-like flavour, and has been recommended as an antiscorbutic. Hamilton says that in India it is given with sugar in cure of diabetes, and from the report of its influence over that disorder, it well deserves to be tried by the European practitioner. It is, however, probable that Dr. Hamilton's remarks apply to *L. ramosissima*. *Linaria Elatine* is said to be bitter and purgative. *Gratiola officinalis* was formerly called *Gratia Dei*, on account of its efficiency as a medicine. It is extremely bitter, acts violently both as a purgative and emetic, and has been said to be the basis of the famous gout medicine called *Eau médicinale*, which, as its active principle appears to be of the nature of *Veratria*, is not improbable. *Gratiola* is said to have been found serviceable in cases of hypochondriasis. In overdoses it is a violent poison, and according to Haller, it renders by its abundance some of the Swiss meadows useless as pastures. *G. peruviana*, *Lin.*, has purgative and emetic leaves and roots. *Bramia serrata* is employed in Brazil in the preparation of baths for rheumatic patients; it has a strong penetrating odour.—*Martius, Choix des pl.* p. 12.

The whole plant of *Franciscea uniflora*, and especially its large root, is called Manacá in Brazil, and is found of great value in exciting the lymphatic system; in consequence of its large use in syphilis it is called by the Portuguese *Mercurio vegetal*; the inner bark and all the herbaceous parts are nauseously bitter; it is regarded as a purgative, emetic, emmenagogue, and alexipharmic; in over-doses it is found an acrid poison.—*Martius, Mat. Med. Bras.* p. 67.

One or two species are named as dyers' plants. The flowers of *Linaria vulgaris* are employed in some places to give a yellow colour; and the roots of *Calceolaria arachnoidea* are largely collected in Chili, under the name of *Relbun*, for dyeing woollen cloths crimson.—*Bot. Mag.* t. 2915.

# GENERA.

[For which I am indebted to Mr. Benthams kindness, Sept., 1845.]

<p>Suborder 1. SALPIGLOSIDÆ.—<i>Benth.</i>—Inflorescence entirely centrifugal. Æstivation of the corolla either altogether plaited, or plaited-imbriate, the two upper segments being external.—<i>G. B.</i></p>	<p><i>Jovellana</i>, Ruiz et Pav. <i>Bæa</i>, Pers. not Com.</p>	<p><i>Agassizia</i>, Chav. <i>Lophospermum</i>, Don. <i>Rhodochiton</i>, Zucc.</p>	<p>Tribe 7. Gratiolææ. Subtribe 1. <i>Aptosimææ</i>.</p>
<p><i>Duboisia</i>, Br. <i>Anthocercis</i>, Lab. <i>Schwenkia</i>, L. <i>Chaetochilus</i>, Vahl. <i>Mathea</i>, Vell.? <i>Leptoglossis</i>, <i>Benth.</i> <i>Heteranthia</i>, <i>Nees et Mrt.</i> <i>Vriolikia</i>, Spreng. <i>Browallia</i>, L. <i>Brunfelsia</i>, Plum. <i>Franciscea</i>, Pohl. <i>Salpiglossis</i>, Ruiz et Pav. <i>Schizanthus</i>, Ruiz et Pav.</p>	<p>Tribe 2. Verbasceæ. <i>Verbascum</i>, L. <i>Ianthe</i>, <i>Griseb.</i> <i>Celsia</i>, L. <i>Ditaxis</i>, Rafin. <i>Neflea</i>, <i>Benth.</i> <i>Thapsandra</i>, <i>Griseb.</i> <i>Staurophragma</i>, <i>Fisch. et Mey.</i></p>	<p>Tribe 5. Cheloneæ. <i>Phygellus</i>, <i>E. Mey.</i> <i>Pawlownia</i>, Zucc. <i>Wightia</i>, Wall. <i>Diplanthera</i>, Banks et Soland.</p>	<p><i>Leucophyllum</i>, H. B. K. <i>Aptosimum</i>, Burch. <i>Ohtendorfia</i>, Lehm. <i>Chilostigma</i>, Hochst. <i>Peliostomum</i>, <i>E. Mey.</i> <i>Anticharis</i>, Endl. <i>Meissarrhena</i>, Br. <i>Doratanthera</i>, <i>Benth.</i></p>
<p>Suborder 2. ANTIRRHINIDÆ.—<i>Benth.</i>—Inflorescence entirely centripetal or compound, (i. e., general inflorescence or primary inflorescence centripetal, partial inflorescence centrifugal.) Æstivation of the corolla bilabiate imbricated, the two upper segments being external.—<i>G. B.</i></p>	<p>Tribe 3. Hememeridææ. <i>Alonsoa</i>, Ruiz et Pav. <i>Schistanthe</i>, Kunze. <i>Angelonia</i>, Humb. et Bp. <i>Physidium</i>, Schrad. <i>Schleperia</i>, <i>Nees.</i> <i>Thylacantha</i>, <i>Nees.</i> <i>Hemimeris</i>, L. <i>Diascia</i>, Link et Otto. <i>Colpasia</i>, <i>E. Mey.</i> <i>Nemesia</i>, Vent. <i>Diclis</i>, <i>Benth.</i></p>	<p><i>Halleria</i>, L. <i>Scrophularia</i>, Tourn. <i>Collinsia</i>, Nutt. <i>Chelone</i>, L. <i>Pentstemon</i>, Lhér. <i>Elmigeria</i>, Rehb. <i>Dasanthera</i>, Raf. <i>Chionophila</i>, <i>Benth.</i> <i>Tetranema</i>, <i>Benth.</i> <i>Russelia</i>, Jacq. <i>Freylinia</i>, Colla. <i>Anastrabe</i>, <i>E. Mey.</i> <i>Teedia</i>, Rud. <i>Borkhausenia</i>, Roth. <i>Ixianthes</i>, <i>Benth.</i> <i>Leuocarpus</i>, Don. <i>Hemichæna</i>, <i>Benth.</i></p>	<p>Subtribe 2. <i>Manuleææ</i>. <i>Nycterinia</i>, Don. <i>Zakuzianskya</i>, J. W. Schm. <i>Polycarena</i>, <i>Benth.</i> <i>Phyllopodium</i>, <i>Benth.</i> <i>Sphenandra</i>, <i>Benth.</i> <i>Sphenostoma</i>, <i>Benth.</i> <i>Lyperia</i>, <i>Benth.</i> <i>Sutera</i>, Roth. <i>Manulea</i>, L. <i>Nemia</i>, Berg.</p>
<p>Tribe 1. Calceolaresæ. <i>Calceolaria</i>, Feuill.</p>	<p>Tribe 4. Antirrhinææ. <i>Linaria</i>, Tourn. <i>Elatine</i>, Moench. <i>Cymbalaria</i>, <i>Kicksia</i>, Dumort. <i>Anarrhinum</i>, Desf. <i>Cardiotheca</i>, Ehrenb. <i>Simbuleta</i>, Forsk. <i>Antirrhinum</i>, L. <i>Orotium</i>, Pers. <i>Maurandia</i>, Ort. <i>Usteria</i>, Chav. <i>Galvezia</i>, Domb.</p>	<p>Tribe 6. Escobediææ. <i>Escobedia</i>, Ruiz et Pav. <i>Silvia</i>, Vell. <i>Physocalyx</i>, Pohl. <i>Melasma</i>, Berg. <i>Nigrina</i>, Linn. <i>Lyncea</i>, Cham. et Scht. <i>Gastromeria</i>, Don. <i>Alectra</i>, Thunb. <i>Starbia</i>, Dup. Thou. <i>Glossostylis</i>, Cham.</p>	<p>Subtribe 3. <i>Eugratiolæææ</i>. <i>Diplacus</i>, Nutt. <i>Mimulus</i>, L. <i>Erythranthe</i>, Spach. <i>Uvedalia</i>, Br. <i>Eunanus</i>, <i>Benth.</i> <i>Melosperma</i>, <i>Benth.</i> <i>Mazus</i>, Lour. <i>Hornemannia</i>, Rehb. <i>Dodartia</i>, Linn. <i>Lindenbergia</i>, Link et Ot. <i>Brachycoris</i>, Schrad. <i>Bocca</i>, Decaisne. <i>Beyrichia</i>, Cham.</p>



[illegible]

NUMBERS. GEN. 176 Sp. 1314 W. 61

Verfahren, etc.

POSITION Bignoniaceae, Scrophulariaceae, Gentianaceae.

## ADDITIONAL GENERAL

Pteroglossis, *Moss*, after Leptoglossis.

Streptosolen, Moss, and Browning

Gambela, *Nat.* after Rhodocytus  
Ducoudrie, *R.* the last of Rhodocytus

Digomphina, *B. 24*, before Physelina  
Tricholoma, *B. 24*, to be reduced

synonym to Gloss-stigma.

### Methods To the Rescue

Environ Biol Fish (2015) 98:109–120

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

1. *Journal of the American Medical Association*, 1997; 277: 1025-1030.

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## ORDER CCLXV. LENTIBULARIACEÆ.—BUTTERWORTS.

Lentibulariæ, *Richard in Flor. Paris*, p. 26. (1808).—Utriculinae, *Hoffmannsegg et Link. Fl. Port.* (1806).—Lentibulariæ, *R. Brown Prodr.* 429. (1810); *Aug. de St. Hilaire, Ann. Sc. Nat.* 2 ser. xi 149.—Utriculariæ, *Endl. Gen. clv.*; *Meisn. Gen.* p. 314; *DC. Prodr.* 8. 2.

DIAGNOSIS.—*Bignonial Erogens*, with a free central placenta, minute seeds without albumen, and cotyledons much smaller than the radicle.

Herbaceous plants, living in water or marshes. Leaves radical, undivided; or compound, resembling roots, and bearing little vesicles. Scapes either with minute stipule-like scales, or naked; sometimes with whorled vesicles; generally undivided. Flowers single, or in spikes, or in many-flowered racemes; with a single bract, rarely without bracts. Calyx divided, persistent, inferior. Corolla monopetalous, hypogynous, irregular, bilabiate. Stamens 2, included within the corolla, and inserted into its base; anthers 1-celled, sometimes contracted in the middle. Ovary composed of 2 valvate carpellary leaves, and therefore 1-celled; style 1, very short; stigma bilabiate; ovules 00, anatropal, placed on a free central placenta. Capsule 1-celled, many-seeded, with a large central placenta. Seeds minute, without albumen; embryo sometimes undivided. Radicle next the hilum.

The central free placenta and minute exalbuminous seeds are the principal points of distinction between these and Figworts, to which their habit approximates them. They are known from Primworts by their irregular flowers, exalbuminous embryo, and didynamous or unsymmetrical stamens, alternate with the segments of the corolla.

Mr. Bentham has remarked that they are very closely allied to Figworts, "having the same calyx, corolla, stamens and bivalve capsule, but distinguished solely by their really unilocular fruit, and the minuteness of their embryo. In respect

of the former character, they come very near to *Limosella*, *Lindernia*, and other *Gratioleæ*, with parallel dissepiments and entire valves; for in these plants the dissepiment is very thin, and usually detaches itself from the valves before maturity, so that being concealed by the seeds, which fill nearly the whole capsule, it often escapes observation, and many of these genera have frequently been described as having a unilocular fruit."

Natives of marshes, or rivulets, or fountains, in all parts of the world, especially within the tropics. The *Genliseæ* are exclusively Brazilian.

*Pinguicula vulgaris* has the property of giving consistence to milk, and of preventing its separating into either whey or cream. It is pretended that its leaves rot sheep; when fresh they are slightly purgative and vulnerary. Linnæus says that the solid milk of the Laplanders is prepared by pouring it warm and fresh from the cow over a strainer on which fresh leaves of *Pinguicula* have been laid. The milk, after passing among them, is left for a day or two to stand, until it begins to turn sour; it throws up no cream, but becomes compact and tenacious, and most delicious in taste. It is not necessary, that fresh leaves should be used after the milk is once turned: on the contrary, a small portion of this solid milk will act upon that which is fresh, in the manner of yeast.

## GENERA.

*Utricularia*, Linn.  
*Lentibularia*, Vaill.  
*Genlisea*, St. Hil.

*Pinguicula*, Tournef.  
*Brandonia*, Reichenb.  
*Polypompholyx*, Lehm.  
*Tetralobus*, A. DC.

NUMBERS. GEN. 4. Sp. 175.

Fig. CCCCLXII.—*Pinguicula vulgaris*—Nees. 1. calyx, &c.; 2. stamen; 3. pistil; 4. longitudinal section of it; 5. half a fruit; 6. seeds, natural size; 7. embryo very much magnified.



#### SUB-CLASS IV. EPIGYNOUS EXOGENS.

In general the complete adhesion of the tube of the calyx to the ovary through its whole length, and the basioxyal flowers, afford a positive mark of distinction for this Sub-Class, which is undoubtedly composed of Orders which form perfectly Natural Alliances, closely related to each other, but indicating very strong lateral affinity for other parts of the system. Thus Campanals approach both Bignoniads, in which Gynæceums have a more inferior ovary, and Solanals, among which Laburnum has the stamens almost free from the corolla; Myrtals lean towards Rosals, whose flowers are furnished with a half inferior ovary in the Order of Applewoods; the frontier of Grossals joins that of Saxifragals, the Currantwoods of the one very nearly agreeing with the Cunoniads of the other; Umbellals are completely imitated by Thaliotrua among the Crowfoots of the Ranaal Alliance, and by Vitaceæ among Berberals; and finally, the Asural Alliance has its analogy in Helwingiads among the Piculous Garryal Alliance, not to mention many other similar cases. So that the Epigynous Sub-Class may be likened to a great kingdom lying in the midst of many others, just as Germany is bordered by France, Holland, Denmark, Poland, Hungary, Turkey, Italy, and Switzerland.

In the two previous Sub-Classes the Epigynous character occasionally breaks out, and sometimes in a very unexpected way; as when the genus Eupomatia appears in the hypogynous Ranaal Alliance; and in many of the Saxifragals. In like manner, both Myrtaleanths and Melastomaceæ have species in which the calyx has but little union with the ovary; these are, however, beyond all question, exceptional instances.

It is here assumed that the inferior ovary is always formed by an adhesion of the calyx to its sides. There may, however, in some cases, be justice in the assertion of Schleiden, that the real inferior ovary is caused by a hollowing out of the peduncle, analogous to what takes place in the *monotropa* Fig. (*Ann. Sc. 2 ser. XVII. 374.*) Possibly such is the origin in Cucurbits, Sandalworts, and others in which no calyx-tube are to be found on the surface of the fruit; and Eschscholtzia may be considered to offer an obvious explanation of this, its peduncle forming, round the base of the ovary, a cup which evidently has nothing to do with the calyx. If that be so, then the structure of Calycanthus, the Rose, and many more will have a similar interpretation. But it is impossible to admit that such is the origin of all the ovaries with a superior calyx. Melastomaceæ, for instance, have evidently a true calyx tube; and even in Umbellales the presence of an adherent calyx tube is demonstrated by those monsters of the wild Clematis which are sometimes found in fields with their "vapours in the nostrils" of ordinary leaves: in such instances these outpuffing leaves spring from the central axis, and are surrounded by the tubular but non-adherent calyx.

Whatever may be the true theory of the inferior ovary, it seems to be a very important point of structure, collecting together species having much resemblance to one another than to anything else, and therefore of great value for natural classification.



ALLIANCE L. *CAMPANALES*.—THE CAMPANAL ALLIANCE.

DIAGNOSIS. — *Epigynous Exogens, with dichlamydeous monopetalous flowers, and an embryo with little or no albumen.*

This, which is probably the most extensive of all the groups, in this Work called Alliances, consists of Orders held together in the strictest bond of union. They form two sets, of which the one has the ovary with more than one cell, and the other with one only ; but they probably have, in all cases, more than one carpel ; and Valerian-worts, with one perfect and two seedless cells, completely joins the groups. In what way they pass into Myrtals will be shown when speaking of that Alliance. From the perigynous series they branch off by way of Gesnerworts, which have a half-superior ovary, to Nightshades, among which there are genera, which like Jaborosa, are Bellworts in most respects, except not having an inferior ovary.

## NATURAL ORDERS OF CAMPANALES.

- |   |                      |
|---|----------------------|
| Ovary 2- or more celled. Anthers free, or half united. Stigma naked. Corolla valvate, regular . . . . .         | } 266. CAMPANULACEÆ. |
| Ovary 2- or more celled. Anthers syngenesious. Stigma surrounded by hairs. Corolla valvate, irregular . . . . . | } 267. LOBELIACEÆ.   |
| Ovary 2- or more celled. Anthers syngenesious or free. Stigma indusiate. Corolla induplicate . . . . .          | } 268. GOODENIACEÆ.  |
| Ovary 2- or more celled. Stamens and style united into a column. Corolla imbricated . . . . .                   | } 269. STYLIDIACEÆ.  |
| Ovary 1-celled. Corolla imbricated. Anthers free. Ovule pendulous. Albumen none . . . . .                       | } 270. VALERIANACEÆ. |
| Ovary 1-celled. Corolla imbricated. Anthers free. Ovule pendulous. Seeds albuminous . . . . .                   | } 271. DIPSACACEÆ.   |
| Ovary 1-celled. Corolla valvate. Anthers syngenesious. Ovule pendulous. Seeds albuminous . . . . .              | } 272. CALYCERACEÆ.  |
| Ovary 1-celled. Corolla valvate. Anthers syngenesious. Ovule erect. Albumen none . . . . .                      | } 273. ASTERACEÆ.    |







nulas the cells of the ovary are equal in number to the stamens and the divisions of the corolla and calyx, which points out the natural symmetry of the flower. In Lobeliads abortion is more frequent. In both groups the innermost organs are abortive more frequently than the outermost. Thus, the number of cells is often smaller (never greater) than that of the stamens; the number of stamens is sometimes smaller (but never larger) than that of the lobes of the corolla; and the same is true of the lobes of the corolla with respect to the calyx. Finally, Lobeliads have sometimes a corolla of a fine bright-red, a colour unknown among Bellworts; nine-tenths of the species of the latter have blue flowers; and those in which the colour varies, and into which a little red enters (as *Canarina*), are far from having the brilliancy of *Lobelia cardinalis* for instance. After Lobeliads, the Natural Orders with which Bellworts have the most relation are, no doubt, Goodeniads and Styleworts, which formed part of the Campanulæ of Jussieu. The regular corolla of Bellworts distinguishes them, at first sight, from both those Orders, as well as from Lobeliads. Besides, Campanulas have not the fringed indusium which terminates the style of Goodeniads and surrounds their stigma. Although this organisation approaches that of Lobeliads, and so of Bellworts, it is not less true that it affords an important mark of distinction, and that it is connected with essential differences in the mode of fecundation. Brown has also remarked, that the corolla of Goodeniads is sometimes polypetalous, which it never is in Bellworts or Lobeliads; that the aestivation of the corolla is induplicate, not valvate; that its principal veins are lateral, or alternate with the lobes, as in Composites; that in the species of Goodeniads with deliscent fruit, the dehiscence is usually septicial, while in the two other groups it is always loculicidal; finally, that Goodeniads have not the milky juice that characterises Bellworts and Lobeliads." Notwithstanding the polyspermous fruit and different inflorescence, this Order approaches very closely to Composites; the milky juice is the same as that of the tribe called Cichoraceæ; the species have, in many cases, the flowers crowded in heads; the stigma is similar to that of many Composites; there are the same collecting hairs on the style, in both cases intended to clear out the pollen from the cells of the anthers; and, finally, the habit is very like. These collecting hairs, which clothe the style of Bellworts in a most remarkable manner, arranging themselves in lines having a direct relation to the number and



Fig. CCCCLXIV.

position of the anthers, have been the subject of special examination by several observers, especially by Adolphe Brongniart. This Botanist ascertained that such hairs are not, as had been supposed, deciduous, but that they are retractile, like the hairs of certain annelides or the tentacula of snails. It appears that, at the time of the expansion of the flower, the hairs, which had previously projected and swept out the pollen from the anthers, are drawn back into certain cavities lying at their base, the upper half sheathing itself in the lower half as it is by degrees withdrawn. M. Brongniart is of opinion that there is no ground for supposing that this singular phenomenon is connected with the fertilising process. (See *Ann. des Sc. Nat.* 2 Ser. 12. 244). But Mr. Hassall disputes this statement, which he declares is "wholly opposed to the result of his investigations."—*Ann. Nat. Hist.* viii. 86.

It has been remarked in the *Botanical Register* (1842, t. 3.), that the genus *Glossocomia* brings the Orders of Nightshades and Bellworts into close contact.

With respect to the singular genus *Sphenoclea*, erected into an Order by Martius, although it cannot be regarded as a genuine species of Bellwort, because of the absence of collecting hairs from its styles, the round sub-sessile anthers, the stamens distinctly inserted upon the corolla, and the peculiar habit of the only known species, yet it seems to have more affinity to this Order than to any other, and may very well be stationed at the end, as a genus waiting for the discovery of companions which may be better suited to indicate its true station.

Chiefly natives of the north of Asia, Europe, and North America, and scarcely known in the hot regions of the world. In the meadows, fields, and forests of the countries they inhabit, they constitute the most striking ornament. Some curious species are found in the Canaries, St. Helena, and Juan Fernandez. Alphonse De Candolle remarks, that "it is within 36° and 47° N. lat. that in our hemisphere the greatest number of species is found; the chain of the Alps, Italy, Greece, Caucasus, the Altai range, are their true country. In whatever direction we leave these limits, the number of species rapidly decreases. In the southern hemisphere, the Cape of Good Hope (lat. 34° S.) is another centre of habitation, containing not fewer than 63 species. This

Fig. CCCCLXIV.—Stamen and pistil of *Campanula Medium*.



locality has a climate so different from that of our country, that it must be readily imagined that the species capable of living there differ from every other those of any other hemisphere; in fact, they belong to other groups." Of 300 species, nearly all were found within the tropics. The same Buffon remarks that, with very few exceptions, "all the species belonging to genera that spread their capitals of lateral extension to the northern hemisphere; while those whose capitals decline to the south extend only to the southern hemisphere."

The milky juice is rather acrid, but nevertheless the roots and young shoots of some species, particularly of *Campanula Rapunculifolia*, or *Rampunculifolia*, and *Phytolacca spicata*, or *Canarina Campanula*, &c., are an occasional article of food. The root of the latter Order, however, is its beauty. The roots of *Phytolacca* are said to be successfully that of *Campanula glauca* is held by the Japanese to be a true, and secondly, valuable Ginseng. The *Specularia Speculum* and *pentagonia* have been used as a substitute for the flowering plant of *Wahlenbergia grandiflora* is used by the physicians of the East of Europe against epilepsy. *Wahlenbergia linearifolia* is employed in form of infusion. The half-fleshy fruit of *Canarina Campanula* is said to be cathartic. The tubercles of *Cypripedium digitata* is said to be eaten by Hottentots.

## CONCLUSIONS

## J. J. AUSTIN

**Jasione, L.**  
*A. h. v. m. t. s.* 10.  
 champ.  
*Großh. A. v. m. s.*

### III. Experimental Results

[illegible]

T. J. G. Jones, A. J. H. 190  
 W. J. H. Jones, A. J. H. 190  
 T. J. H. Jones, A. J. H. 190  
 S. G. H. Jones, A. J. H. 190

Assistant, Alph. DC.  
 Cassin, D.C.

III. *It is a matter of degree whether a*

*Prosopis juliflora*, D. Don  
Roella, *L.*  
— *fruticosa*, Pursh  
L'Amour, *Atlas*, 3: 8

## IV. CONCLUSIONS

{ } , .

Shimizu, M., T. Kato,  
Y. Kato, and M. Arai.  
2000. *Journal of Ecology* 88:  
1000-1010.

1. *Chlorophyll a* (Chl *a*)  
 2. *Chlorophyll b* (Chl *b*)  
 3. *Chlorophyll c* (Chl *c*)  
 4. *Chlorophyll d* (Chl *d*)  
 5. *Chlorophyll e* (Chl *e*)  
 6. *Chlorophyll f* (Chl *f*)  
 7. *Chlorophyll g* (Chl *g*)  
 8. *Chlorophyll h* (Chl *h*)  
 9. *Chlorophyll i* (Chl *i*)  
 10. *Chlorophyll j* (Chl *j*)  
 11. *Chlorophyll k* (Chl *k*)  
 12. *Chlorophyll l* (Chl *l*)  
 13. *Chlorophyll m* (Chl *m*)  
 14. *Chlorophyll n* (Chl *n*)  
 15. *Chlorophyll o* (Chl *o*)  
 16. *Chlorophyll p* (Chl *p*)  
 17. *Chlorophyll q* (Chl *q*)  
 18. *Chlorophyll r* (Chl *r*)  
 19. *Chlorophyll s* (Chl *s*)  
 20. *Chlorophyll t* (Chl *t*)  
 21. *Chlorophyll u* (Chl *u*)  
 22. *Chlorophyll v* (Chl *v*)  
 23. *Chlorophyll w* (Chl *w*)  
 24. *Chlorophyll x* (Chl *x*)  
 25. *Chlorophyll y* (Chl *y*)  
 26. *Chlorophyll z* (Chl *z*)  
 27. *Chlorophyll aa* (Chl *aa*)  
 28. *Chlorophyll ab* (Chl *ab*)  
 29. *Chlorophyll ac* (Chl *ac*)  
 30. *Chlorophyll ad* (Chl *ad*)  
 31. *Chlorophyll ae* (Chl *ae*)  
 32. *Chlorophyll af* (Chl *af*)  
 33. *Chlorophyll ag* (Chl *ag*)  
 34. *Chlorophyll ah* (Chl *ah*)  
 35. *Chlorophyll ai* (Chl *ai*)  
 36. *Chlorophyll aj* (Chl *aj*)  
 37. *Chlorophyll ak* (Chl *ak*)  
 38. *Chlorophyll al* (Chl *al*)  
 39. *Chlorophyll am* (Chl *am*)  
 40. *Chlorophyll an* (Chl *an*)  
 41. *Chlorophyll ao* (Chl *ao*)  
 42. *Chlorophyll ap* (Chl *ap*)  
 43. *Chlorophyll aq* (Chl *aq*)  
 44. *Chlorophyll ar* (Chl *ar*)  
 45. *Chlorophyll as* (Chl *as*)  
 46. *Chlorophyll at* (Chl *at*)  
 47. *Chlorophyll au* (Chl *au*)  
 48. *Chlorophyll av* (Chl *av*)  
 49. *Chlorophyll aw* (Chl *aw*)  
 50. *Chlorophyll ax* (Chl *ax*)  
 51. *Chlorophyll ay* (Chl *ay*)  
 52. *Chlorophyll az* (Chl *az*)  
 53. *Chlorophyll aza* (Chl *aza*)  
 54. *Chlorophyll abz* (Chl *abz*)  
 55. *Chlorophyll acz* (Chl *acz*)  
 56. *Chlorophyll adz* (Chl *adz*)  
 57. *Chlorophyll aez* (Chl *aez*)  
 58. *Chlorophyll afz* (Chl *afz*)  
 59. *Chlorophyll agz* (Chl *agz*)  
 60. *Chlorophyll ahz* (Chl *ahz*)  
 61. *Chlorophyll aiz* (Chl *aiz*)  
 62. *Chlorophyll ajz* (Chl *ajz*)  
 63. *Chlorophyll akz* (Chl *akz*)  
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 66. *Chlorophyll anz* (Chl *anz*)  
 67. *Chlorophyll aoz* (Chl *aoz*)  
 68. *Chlorophyll apz* (Chl *apz*)  
 69. *Chlorophyll aqz* (Chl *aqz*)  
 70. *Chlorophyll arz* (Chl *arz*)  
 71. *Chlorophyll asz* (Chl *asz*)  
 72. *Chlorophyll atz* (Chl *atz*)  
 73. *Chlorophyll auz* (Chl *auz*)  
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 78. *Chlorophyll azz* (Chl *azz*)  
 79. *Chlorophyll azaa* (Chl *aza*)  
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 92. *Chlorophyll anz* (Chl *anz*)  
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 94. *Chlorophyll apz* (Chl *apz*)  
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 104. *Chlorophyll azz* (Chl *azz*)  
 105. *Chlorophyll azaa* (Chl *aza*)  
 106. *Chlorophyll abz* (Chl *abz*)  
 107. *Chlorophyll acz* (Chl *acz*)  
 108. *Chlorophyll adz* (Chl *adz*)  
 109. *Chlorophyll aez* (Chl *aez*)  
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 112. *Chlorophyll ahz* (Chl *ahz*)  
 113. *Chlorophyll aiz* (Chl *aiz*)  
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 115. *Chlorophyll akz* (Chl *akz*)  
 116. *Chlorophyll alz* (Chl *alz*)  
 117. *Chlorophyll amz* (Chl *amz*)  
 118. *Chlorophyll anz* (Chl *anz*)  
 119. *Chlorophyll aoz* (Chl *aoz*)  
 120. *Chlorophyll apz* (Chl *apz*)  
 121. *Chlorophyll aqz* (Chl *aqz*)  
 122. *Chlorophyll arz* (Chl *arz*)  
 123. *Chlorophyll asz* (Chl *asz*)  
 124. *Chlorophyll atz* (Chl *atz*)  
 125. *Chlorophyll auz* (Chl *auz*)  
 126. *Chlorophyll avz* (Chl *avz*)  
 127. *Chlorophyll awz* (Chl *awz*)  
 128. *Chlorophyll axz* (Chl *axz*)  
 129. *Chlorophyll ayz* (Chl *ayz*)  
 130. *Chlorophyll azz* (Chl *azz*)  
 131. *Chlorophyll azaa* (Chl *aza*)  
 132. *Chlorophyll abz* (Chl *abz*)  
 133.

Kuznetsov, G.  
 Kuznetsov, D.  
 Kuznetsov, N.  
 Kuznetsov, P.  
 Kuznetsov, H.

1. 1. 1.

2000, 1999, 1998, 1997, 1996, 1995, 1994, 1993, 1992, 1991, 1990, 1989, 1988, 1987, 1986, 1985, 1984, 1983, 1982, 1981, 1980, 1979, 1978, 1977, 1976, 1975, 1974, 1973, 1972, 1971, 1970, 1969, 1968, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1959, 1958, 1957, 1956, 1955, 1954, 1953, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1943, 1942, 1941, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1922, 1921, 1920, 1919, 1918, 1917, 1916, 1915, 1914, 1913, 1912, 1911, 1910, 1909, 1908, 1907, 1906, 1905, 1904, 1903, 1902, 1901, 1900, 1899, 1898, 1897, 1896, 1895, 1894, 1893, 1892, 1891, 1890, 1889, 1888, 1887, 1886, 1885, 1884, 1883, 1882, 1881, 1880, 1879, 1878, 1877, 1876, 1875, 1874, 1873, 1872, 1871, 1870, 1869, 1868, 1867, 1866, 1865, 1864, 1863, 1862, 1861, 1860, 1859, 1858, 1857, 1856, 1855, 1854, 1853, 1852, 1851, 1850, 1849, 1848, 1847, 1846, 1845, 1844, 1843, 1842, 1841, 1840, 1839, 1838, 1837, 1836, 1835, 1834, 1833, 1832, 1831, 1830, 1829, 1828, 1827, 1826, 1825, 1824, 1823, 1822, 1821, 1820, 1819, 1818, 1817, 1816, 1815, 1814, 1813, 1812, 1811, 1810, 1809, 1808, 1807, 1806, 1805, 1804, 1803, 1802, 1801, 1800, 1799, 1798, 1797, 1796, 1795, 1794, 1793, 1792, 1791, 1790, 1789, 1788, 1787, 1786, 1785, 1784, 1783, 1782, 1781, 1780, 1779, 1778, 1777, 1776, 1775, 1774, 1773, 1772, 1771, 1770, 1769, 1768, 1767, 1766, 1765, 1764, 1763, 1762, 1761, 1760, 1759, 1758, 1757, 1756, 1755, 1754, 1753, 1752, 1751, 1750, 1749, 1748, 1747, 1746, 1745, 1744, 1743, 1742, 1741, 1740, 1739, 1738, 1737, 1736, 1735, 1734, 1733, 1732, 1731, 1730, 1729, 1728, 1727, 1726, 1725, 1724, 1723, 1722, 1721, 1720, 1719, 1718, 1717, 1716, 1715, 1714, 1713, 1712, 1711, 1710, 1709, 1708, 1707, 1706, 1705, 1704, 1703, 1702, 1701, 1700, 1699, 1698, 1697, 1696, 1695, 1694, 1693, 1692, 1691, 1690, 1689, 1688, 1687, 1686, 1685, 1684, 1683, 1682, 1681, 1680, 1679, 1678, 1677, 1676, 1675, 1674, 1673, 1672, 1671, 1670, 1669, 1668, 1667, 1666, 1665, 1664, 1663, 1662, 1661, 1660, 1659, 1658, 1657, 1656, 1655, 1654, 1653, 1652, 1651, 1650, 1649, 1648, 1647, 1646, 1645, 1644, 1643, 1642, 1641, 1640, 1639, 1638, 1637, 1636, 1635, 1634, 1633, 1632, 1631, 1630, 1629, 1628, 1627, 1626, 1625, 1624, 1623, 1622, 1621, 1620, 1619, 1618, 1617, 1616, 1615, 1614, 1613, 1612, 1611, 1610, 1609, 1608, 1607, 1606, 1605, 1604, 1603, 1602, 1601, 1600, 1599, 1598, 1597, 1596, 1595, 1594, 1593, 1592, 1591, 1590, 1589, 1588, 1587, 1586, 1585, 1584, 1583, 1582, 1581, 1580, 1579, 1578, 1577, 1576, 1575, 1574, 1573, 1572, 1571, 1570, 1569, 1568, 1567, 1566, 1565, 1564, 1563, 1562, 1561, 1560, 1559, 1558, 1557, 1556, 1555, 1554, 1553, 1552, 1551, 1550, 1549, 1548, 1547, 1546, 1545, 1544, 1543, 1542, 1541, 1540, 1539, 1538, 1537, 1536, 1535, 1534, 1533, 1532, 1531, 1530, 1529, 1528, 1527, 1526, 1525, 1524, 1523, 1522, 1521, 1520, 1519, 1518, 1517, 1516, 1515, 1514, 1513, 1512, 1511, 1510, 1509, 1508, 1507, 1506, 1505, 1504, 1503, 1502, 1501, 1500, 1499, 1498, 1497, 1496, 1495, 1494, 1493, 1492, 1491, 1490, 1489, 1488, 1487, 1486, 1485, 1484, 1483, 1482, 1481, 1480, 1479, 1478, 1477, 1476, 1475, 1474, 1473, 1472, 1471, 1470, 1469, 1468, 1467, 1466, 1465, 1464, 1463, 1462, 1461, 1460, 1459, 1458, 1457, 1456, 1455, 1454, 1453, 1452, 1451, 1450, 1449, 1448, 1447, 1446, 1445, 1444, 1443, 1442, 1441, 1440, 1439, 1438, 1437, 1436, 1435, 1434, 1433, 1432, 1431, 1430, 1429, 1428, 1427, 1426, 1425, 1424, 1423, 1422, 1421, 1420, 1419, 1418, 1417, 1416, 1415, 1414, 1413, 1412, 1411, 1410, 1409, 1408, 1407, 1406, 1405, 1404, 1403, 1402, 1401, 1400, 1399, 1398, 1397, 1396, 1395, 1394, 1393, 1392, 1391, 1390, 1389, 1388, 1387, 1386, 1385, 1384, 1383, 1382, 1381, 1380, 1379, 1378, 1377, 1376, 1375, 1374, 1373, 1372, 1371, 1370, 1369, 1368, 1367, 1366, 1365, 1364, 1363, 1362, 1361, 1360, 1359, 1358, 1357, 1356, 1355, 1354, 1353, 1352, 1351, 1350, 1349, 1348, 1347, 1346, 1345, 1344, 1343, 1342, 1341, 1340, 1339, 1338, 1337, 1336, 1335, 1334, 1333, 1332, 1331, 1330, 1329, 1328, 1327, 1326, 1325, 1324, 1323, 1322, 1321, 1320, 1319, 13

1. *Chrysomelidae* (beetles)  
 2. *Curculionidae* (beetles)  
 3. *Chrysomelidae* (beetles)  
 4. *Chrysomelidae* (beetles)

44. *Staphylococcus aureus* is a Gram-positive, spherical bacterium that is commonly found on the skin and in the nose. It is a facultative anaerobe and can grow in the presence or absence of oxygen. It is a major cause of skin infections and is also responsible for food poisoning.

New Mexico, June 20, 1900.

POSITION — Asiatic — CAMPANACEAE — *Leptocarpus*  
*Franchetii*.

Dr. W. J. R. D. (1911) *Synopses of the types of the Ophiurinae*

#### ADDITIONAL CASES



## ORDER CCLXVII. LOBELIACEÆ.—LOBELIADS.

Campanulaceæ, § 2. *R. Brown Prodr.* 562. (1810).—Lobeliaceæ, *Juss. Ann. Mus.* 18. 1. (1811); *Endl. Gen.* cxxiv.; *DC. Prodr.* 7. 339; *Presl. Monogr. Lobel.*; *Alph. DC. in Ann. Sc.* 2. Ser. xii. 149.

DIAGNOSIS.—*Campanul Exogens, with a 2- or more-celled ovary, syngenesious anthers, a stigma surrounded by hairs, and a valvate irregular corolla.*

Herbaceous plants or shrubs, with milky juice. Leaves alternate, without stipules. Flowers axillary or terminal. Calyx superior, 5-lobed or entire. Corolla monopetalous,

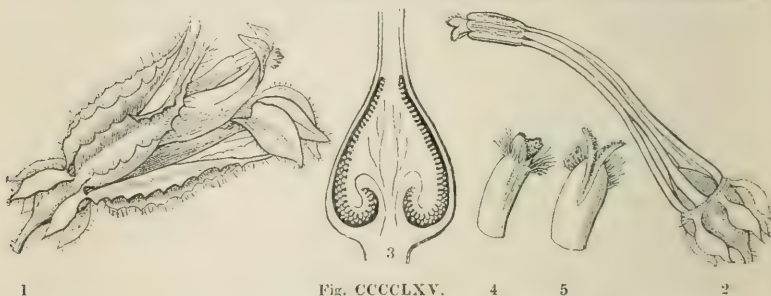


Fig. CCCCLXV.

in æstivation somewhat valvate, irregular, inserted in the calyx, 5-lobed or deeply 5-cleft. Stamens 5, inserted into the calyx alternately with the lobes of the corolla; anthers cohering; pollen oval. Ovary inferior, with from 1 to 3 cells; ovules very numerous, either attached to the axis, or parietal; style simple, stigma surrounded by a cup-like fringe. Fruit capsular, 1- or more-celled, many-seeded, dehiscing at the apex. Seeds attached either to the lining or the axis of the pericarp; embryo straight, in the axis of fleshy albumen; radicle longer than the cotyledons, pointing to the hilum.

The plants of this Order at first sight appear to be very different from Composites, but they in fact participate in all the analogies of Bellworts, and perhaps are yet more nearly related to Composites even than that Order, especially in their syngenesious anthers and in the irregularity of their corolla, which is split so that the segments cohere on one side like the 5 segments which make up the ligulate floret of a Composite. The stigma is surrounded by hairs, which are probably analogous to the collectors of Bellworts, to which Lobeliads approach closely, as well as to Goodeniads, whose indusium and induplicate corolla offer the main features of distinction. The Clintoneæ are remarkable for a one-celled ovary with parietal placentæ; a few species have polypetalous flowers, and one species of *Lobelia* is said to be dioecious!

Unlike Bellworts, these seem to prefer countries within or upon the border of the tropics to such as have a colder character. We find them abounding in the West Indies, Brazil, the Himalayan region, the Cape of Good Hope, and the Sandwich Islands; and they are not uncommon in Chile and New Holland.

All the species are dangerous or suspicious, in consequence of the excessive acidity of their milk. *Siphocampylus Caoutchouc* is so named by the inhabitants of Popayan from the tenacity of its juice. *Tupa Fenilkei* yields a dangerous poison in Chile. The most active article of the North American *Materia Medica* is said to be the *Lobelia inflata*; it possesses an emetic, sudorific, and powerful expectorant effect; when given with a view to empty the stomach it operates vehemently and speedily; producing, however, great relaxation, debility, and perspiration, and even death, if given in over-doses. The anti-syphilitic virtues ascribed to *Lobelia siphilitica* are supposed to have resided in its diuretic property; they are, however, generally discredited. *Isotoma longiflora*, a native of some of the West India Islands, is one of the most venomous of plants; the Spanish Americans call it *Prebenta Cavallos*, because it proves fatal to horses that eat it, swelling them until they burst; taken internally, it acts as a violent cathartic, the effects of which no remedy can assuage, and which end in death; the leaves are active vesi-

Fig. CCCCLXV. *Lobelia siphilitica*. 1. an entire flower; 2. the stamens; 3. perpendicular section of the ovary; 4 and 5 stigmas.



cants. *Lobelia cardinalis* is an erect plant and *Pseudocatharanthus* is a rare European plant, derives its name from its blooming quality. It is alleged that the succulent fruit of *Centropogon strictus* is edible.

GENERAL.

Lepidoptera.		Hymenoptera.	
I. CLEONIDAE.	<i>Hemithysa</i> , Des.	<i>Synanthus</i> , Latr.	(10) 10
Grammatobora, Presl.	<i>Lachusa</i> , Latr. 10	<i>Phaenocarpa</i> , Latr.	10
Cleonia, Latr.	<i>Synanthus</i> , Alph. DC.	<i>Phaenocarpa</i> , Latr.	10
<i>Clypeina</i> , H. B. K.	<i>Phaenocarpa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
<i>Hypsela</i> , Presl.	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
II. LACHUSIDAE.	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
<i>Materna</i> , Presl.	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
<i>Paratrichia</i> , G. Auct.	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
<i>Apethia</i> , Presl.	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
<i>Dombrowskya</i> , Presl.	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10
<i>Monopsis</i> , Latr.	<i>Lachusa</i> , Latr.	<i>Phaenocarpa</i> , Latr.	10

NUMBERS, GEN. 27. Sp. 311.

Position.—Composite. Lobeliaef. = *Compositae*.

In Abyssinia the furinaceous tubers of *Cypripedium* glaucum are eaten by the Tupa Rhynchopetalum, or Djibarra, of the same country. In all the extremely venomous, the smoke of its wood, if inhaled, causes a fatal atmosphere is even said to be fatal. Its seeds, mixed with honey, have the power of facilitating parturition. — *A. Richard.*

## ADDITIONAL CONTENTS

Reinhold, *Walter*. *Walter* = *Walter*.  
Sunderland, *Walter*. *Walter* = *Walter*.  
Sunderland, *Walter*. *Walter* = *Walter*.



## ORDER CCLXVIII. GOODENIACEÆ.—GOODENIADS.

*Campanula*, Juss. Gen. 163. (1789) in part.—*Goodenovia*, R. Brown Prodr. 573. (1810); *Bartl. Ord. Nat.* 148. (1830); *DC. Prodr.* 7. 502.—*Goodeniaceæ*, Ed. pr. clxxxiv. (1836); *Endl. Gen.* cxiii.—*Scævola*, Ed. pr. clxxviii. (1830).—*Scævola*, Ed. pr. clxxxv. (1836).

DIAGNOSIS.—*Campanul Exogens*, with a 2- or more-celled ovary, syngenesious or free anthers, an indusiate stigma, and induplicate corolla.

Herbaceous plants, rarely shrubs, without milk, with simple or glandular hairs, if any are present. Leaves scattered, often lobed, without stipules, very rarely opposite.



Fig. CCCCLXVI.

Inflorescence terminal, variable. Flowers distinct, never capitate, usually yellow, or blue, or pink. Calyx usually superior, rarely inferior, equal or unequal, in from 3 to 5 divisions. Corolla always more or less superior, monopetalous, more or less irregular, withering; its tube split at the back, and sometimes capable of being separated into 5 pieces, when the calyx only coheres with the base of the ovary; its limb 5-parted, with 1 or 2 lips, the edges of the segments being thinner than the middle, and folded inwards in æstivation. Stamens 5, distinct, alternate with the segments of the corolla; anthers distinct or cohering, 2-celled, bursting longitudinally. Pollen simple or in fours. Ovary 1-2-celled, rarely 4-celled, with definite or 00 ovules, having sometimes a gland at its base between the two anterior filaments; placenta free, central, or only adhering slightly to the dissepiments; style 1, simple, very rarely divided; stigma fleshy, undivided, or 2-lobed, surrounded by a membranous cup. Fruit a 1-2- or 4-celled capsule with many solitary or numerous seeds, attached to the axis of the dissepiment, which is usually parallel with the valves, rarely opposite to them. Seeds usually with a thickened testa, which is sometimes nut-like; albumen fleshy, in-

closing an erect embryo; cotyledons foliaceous; plumule inconspicuous.

The great peculiarity of this Order resides in the stigma, which is seated at the bottom of a cup or covering called an indusium, unknown in Bellworts or Lobeliads, to which the genera might otherwise be referred. It is of the same nature as what is found in Brunoniads and Styleworts, and is to be regarded as nothing more than a remarkable exaggeration of the rim which surrounds the stigmatic surface of Heathworts, and of the plates which cover the style of Cranesbills and Balsams. It is, in fact, the upper free extremity of the carpellary leaves, distinct from that prolongation of the placenta which is named style and stigma. Brown, however, has offered a very different explanation of its nature, as will be seen by the following extract:—

"Is this remarkable covering of the stigma in these families merely a process of the apex of the style? or is it a part of distinct origin, though intimately cohering with the pistillum? On the latter supposition, may it not be considered as analogous to the glandular disk surrounding or crowning the ovarium in many other families? And, in adopting the hypothesis I have formerly advanced respecting the nature of this disk in certain families,—namely, that it is composed of a series of modified stamina,—has not the part in question a considerable resemblance, in apparent origin and division, to the stamina of the nearly-related family Stylidiaceæ? To render this supposition somewhat less paradoxical, let the comparison be made especially between the indusium of Brunonia and the imperfect antheræ in the female flowers of Forstera. Lastly, con-



meeted with this view, it becomes of importance to ascertain whether the members of Stylidiaceæ are opposite to the segments of rays or of corolla. The latter statement would be in favour of the hypothesis. This, however, is a point which will not so easily be determined, the stamens being lateral. In two other cases, the position and division of the corolla favours the Stylidium position (if not altogether unopposable) thus being opposite to the segments of the corolla.

In the aestivation of the corolla the Goodeniaceæ give rise remarkably, the adjacent segments being doubled anteriorly, so as to assume the appearance of being included in a triangular back. Cyphia, noticed before by Endlicher, seems thus characterised; also seems to be merely an irregular bellwort with the collecting leaves of the corolla arranged in a ring beneath the stigma.

These plants belong to Australia and the islands of the Southern Ocean, so little advance into India in the form of a *Scaevola*, which even spreads into *Astragalus* is said, the West Indies, and of *Scleria*, which inhabits the southern part of North America.

The leaves of *Scaevola Taccada* when young are eaten as pot-herbs and some nutritious qualities are ascribed to its berries; the pith, which is very good, is used as fashioned by the Malays into artificial flowers and other ornaments. *Scaevola* (like the dogan) appears to be excellent, and is used in India to bring tumours to a head. — *Ann. Trans.* 12: 134.

GENERA.

I. <i>Scaevola</i> .—Fruit a dryope or nut.	<i>Goodenium</i> , Don. <i>Peperomia</i> , L. Will. <i>Dianthus</i> , R. Br. <i>Dioscorea</i> , R. Br.	<i>Goodenia</i> , Will. <i>Goodenia</i> , André. <i>Goodenia</i> , Don. <i>Goodenia</i> , L. Will. <i>Goodenia</i> , Will. <i>Goodenia</i> , Will. <i>Goodenia</i> , Will.	<i>Goodenia</i> , Will. <i>Goodenia</i> , André. <i>Goodenia</i> , Don. <i>Goodenia</i> , L. Will. <i>Goodenia</i> , Will. <i>Goodenia</i> , Will. <i>Goodenia</i> , Will.
<i>Scaevola</i> , L. <i>Lobelia</i> , Plum. <i>Cypripedium</i> , Lour. <i>Cypripedium</i> , Lour. <i>Piper</i> , A. DC. <i>Lycopodium</i> , G. Don.	II. <i>Goodeniaceæ</i> .—Fruit a capsule. <i>Scleria</i> , C. Don.	<i>Goodenia</i> , Will. <i>Goodenia</i> , André. <i>Goodenia</i> , Don. <i>Goodenia</i> , L. Will. <i>Goodenia</i> , Will. <i>Goodenia</i> , Will. <i>Goodenia</i> , Will.	<i>Goodenia</i> , Will. <i>Goodenia</i> , André. <i>Goodenia</i> , Don. <i>Goodenia</i> , L. Will. <i>Goodenia</i> , Will. <i>Goodenia</i> , Will. <i>Goodenia</i> , Will.

NUMBERS, GEN. 14. Sp. 1501

*Heisteria*, C. Don.

POSITION.—Lobeliaceæ.—Goodeniaceæ.—Stylidiaceæ.

The Order has been carefully revised by FR. VAILLANT in *Journal de Goodeniaceæ* in *Nederlandsch Kruidkundig Archief*, Vol. II.

*Goodenia*, C. Don.



Fig. CCCCLXVI. A.—*Goodenia*, C. Don.



## ORDER CCLXIX. STYLIDIACEÆ.—STYLEWORKS.

Stylidæ, *R. Brown Prodr.* 565. (1810); *Endl. Gen.* cxxvi.; *DC. Prodr.* 7. 331.

DIAGNOSIS.—*Campanul Exogens*, with a 2- or more-celled ovary, stamens and style united into a column, and imbricated corolla.

Herbaceous plants or under-shrubs, without milk, having a stem or scape; their hair, when they have any, simple, acute, or headed with a gland. Leaves scattered, sometimes whorled, entire, their margins naked or ciliated, the radical ones clustered in the species with scapes. Stipules 0. Flowers in spikes, racemes, or corymbs, or solitary, terminal, rarely axillary, the pedicels usually with three bracts. Calyx adherent, with from 2 to 6 divisions, bilabiate or regular, persistent. Corolla monopetalous, falling off late; its limb irregular, rarely regular, with from 5 to 6 divisions, imbricated in aestivation. Stamens 2; filaments connate with the style into a longitudinal column; anthers twin, sometimes simple, lying over the stigma; pollen globose, simple, sometimes angular. Ovary 2-celled, many-seeded, sometimes 1-celled, in consequence of the contraction of the dissepiment; often surmounted with a single gland in front, or two opposite ones; style 1; stigma entire or bifid; ovules anatropal. Capsule with 2 valves and 2 cells, the dissepiment between which being sometimes either contracted or separable from the inflexed margins of the valves, the capsule becomes as it were 1-celled. Seeds small, erect, sometimes stalked, attached to the axis of the dissepiment; embryo scarcely known; said to be minute, inclosed within a fleshy, somewhat oily albumen.



Fig. CCCCLXVII.

These are very curious little plants, nearly allied to Bellworts and Goodeniads, from both which they are distinguished by their gynandrous structure, and from the latter by the want of an indusium to the stigma. The structure of the column, into which the stamens and style are blended, is highly curious, and scarcely analogous to anything else in the Vegetable Kingdom, except in Orchids: the stigma lies in a cavity at the apex of the column, surrounded and concealed by the anthers. This column is extremely irritable; in Stylidium it hangs down on one side of the flower until it is touched, when it suddenly springs up and shifts instantly to the opposite side. A singular error was committed by Labillardière, who mistook an epigynous gland for the stigma; and another by L. C. Richard, who considered

the labellum to be the female organ of this genus.

The species are chiefly found in New Holland swamps. One however occurs in Ceylon, another in Malabar, and a third in Sylhet. The *Forsteras* live on the summit of mountains in the South of New Zealand, or in the morasses of the Straits of Magellan.

Nothing is known of any use to which they are applied.



Fig. CCCLXVIII.

# GENERA.

*Stylidium*, Sw.  
*Ventenatia*, Smith.  
*Cundollea*, Labill.

*Andersonia*, König  
*Coleostylis*, Sonder.  
*Forsteropsis*, Sonder.

*Levenhookia*, R. Br.  
*Gynocampus*, Lesch.  
*Forstera*, Linn. f.

*Phyllachne*, Forst.  
*Stibas*, Commers.

NUMBERS. GEN. 5. Sp. 121.

POSITION.—Lobeliaceæ.—STYLIDIACEÆ.—Goodeniaceæ.

Fig. CCCCLXVII.—*Stylidium calcaratum*.—*F. Bauer*. 1. anthers and stigma, forming the point of the column; 2. capsule split open; 3. seed.

Fig. CCCCLXVIII.—*Forstera clavigera*.—*Hooker fl.* 1. the epigynous gland.







and sometimes 2 other abortive ones ; ovule solitary, pendulous ; style simple ; stigmas from 1 to 3. Fruit dry, indehiscent, with 1 fertile cell and 2 empty ones. Seed solitary, pendulous ; embryo straight, destitute of albumen ; radicle superior.

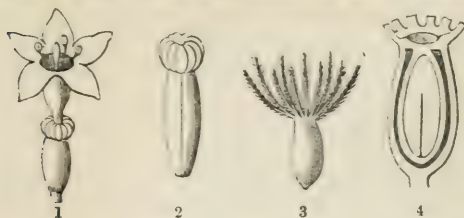


Fig. CCCCLXX.

Valerianworts are principally distinguished from Teazelworts by their want of albumen, and usually by the absence of an involucre to each floret. They have also but little tendency to form a capitate inflorescence ; and a couple of additional empty cells, frequently observable in their ovary, indicates a higher degree of composition in the central apparatus. M. Bunge has observed manifest traces of ovules in the two abortive cells of *Patrinia* ; the same author considers Valerianworts connected with *Caprifoli* on the one hand by *Triplostegia*, and on the other by *Linnaea*.—*Ann. Sc. ser. 2. v. 6. 60.*

They are natives of most temperate climates ; sometimes at considerable elevations. They are abundant in the north of India, Europe, and South America, but uncommon in Africa and North America.

The roots of *Valeriana officinalis*, *Phu*, and *celtica*, are tonic, bitter, aromatic, antispasmodic, and vermifugal ; they are even said to be febrifugal. They are strong-smelling, especially in *V. Dioscoridis*, which, according to Sibthorp, is the real *Phu* of Dioscorides, act as powerful stimulants, and produce a specific influence over the cerebro-spinal system, bringing on, as is well known, a kind of intoxication in cats, and in large doses occasioning in man scintillations, agitation, and even convulsions. The Russians regard the *Valeriana sitchensis*, a native of North-West America, as the most energetic of all the species. The scent of these roots is not agreeable to a European ; and yet some are highly esteemed as perfumes. Eastern nations procure from the mountains of Austria the *Valeriana celtica* and *Saliunca* to aromatise their baths. Their roots are grubbed up with danger and difficulty by the peasants of Styria and Carinthia, from rocks on the borders of eternal snow, are tied in bundles and sold at a very low price to merchants, who send them by way of Trieste to Turkey and Egypt, where they are vended at a great profit, and passed onwards to the nations of India and Ethiopia.—*Endl.* The *Nardostachys Jatamansi*, or true Spikenard of the ancients, is valued in India, not only for its scent, but also as a remedy in hysteria and epilepsy. The young leaves of the species of *Valerianella* are eaten as salad, under the French name of *Mâche*, or the English one of *Lamb's Lettuce*. Red Valerian is also eaten in the same way in Sicily. *Astrephias* are used as vulneraries in Peru. See *Royle*, p. 242, for an elaborate dissertation upon the Nard of the ancients.

#### GENERA.

<i>Patrinia</i> , Juss.	<i>Polypremum</i> , Adans.	<i>Mitrophora</i> , Neck.	<i>Aretiastrum</i> , DC.
<i>Gylmanthus</i> , Rafin.	<i>Odontostreptis</i> , Neck.	<i>Plectritis</i> , DC.	<i>Phu</i> , DC.
<i>Fedia</i> , Adans.	<i>Astrephia</i> , DC.	<i>Centranthus</i> , DC.	<i>Betckea</i> , DC.
<i>Nardostachys</i> , DC.	<i>Hemesotria</i> , Rafin.	<i>Kentranthus</i> , Neck.	<i>Triplostegia</i> , Wall.
<i>Dufresnea</i> , DC.	<i>Obliquea</i> , Willd.	<i>Valeriana</i> , Neck.	? <i>Axia</i> , Lour.
<i>Valerianella</i> , Mönch.	<i>Fedia</i> , Mönch.	<i>Phyllactis</i> , Pers.	<i>Porteria</i> , Hook.

NUMBERS. GEN. 12. Sp. 185.

*Cupressuliaceæ.*

POSITION.—Asteraceæ.—VALERIANACEÆ.—Dipsacaceæ.

Fig. CCCCLXX.—*Valeriana celtica*. 1. entire flower magnified ; 2. the ovary and young calyx ; 3. the fruit, with the pappose full-grown calyx ; 4. a vertical section of fruit and seed



## ORDER COLXMI DIPSAACEAE-7

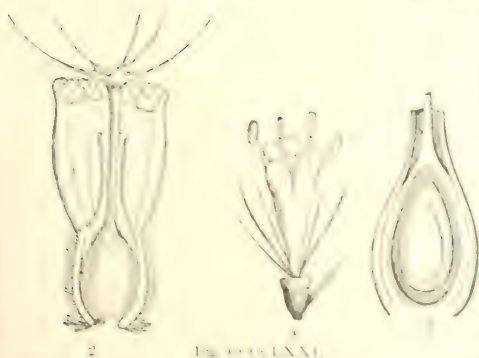
Diagnosis: *Journal Comp. 164* (178); *Canadian Medical Association Journal* 2 (1902): 433; *British Medical Journal* 1902: 1410.

**DIAGNOSIS.**—*Campanal Erouens*, with a flattened snout, short and widely separated eyes, and a few small, and all on one side.

Herbaceous plants or subshrubs. Leaves opposite or whorled. Flowers placed upon a common receptacle and surrounded by a many-branched involucre.



adherent, involute, sessile, usually 2-3  
 pairs, surrounded by a narrow, translucent  
 corolla membrane, tubular, inserted  
 in the bag; 1 first calyx, 4 or 5 broad  
 with an indented ovation. Stamens  
 4, alternate with the lobes in the corolla,  
 sometimes 6, with 2 without anthers.  
 Ovary inferior, 3-lobed, with a large  
 persistent central seed; style in-  
 stant single. Fruit an indehiscent  
 pod, covered by the pericarpium,  
 only; embryo straight, is dorsum in a  
 small quantity of fleshy albumen, coty-  
 ledons.

[illegible]

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Fig. CCCXXXI. Soluble polypropylene. 1, polymer; 2, thin filament coated by both hot water and latex; 3, particular section of trace.



tube is entirely distinct from the ovarium. This kind of partial cohesion between pistillum and calyx is directly opposite to what usually takes place, namely, the base of the ovarium being coherent, while its upper is distinct. It equally, however, determines the apparent origin or insertion of corolla and stamina, producing the unexpected combination of 'flos superus' with 'ovarium liberum.'"—*Linn. Trans.* 12. 138.

The species are chiefly natives of the south of Europe, Barbary, the Levant, and the Cape of Good Hope; not affecting particular stations in any striking degree, except that they generally shun cold, and do not attain much elevation above the sea.

Their properties are unimportant. The Teazel used by fullers in dressing cloth is the dried head of *Dipsacus Fullonum*, bristling with hard, stiff, spiny bracts. Some of the species are reputed febrifugal. *Scabiosa succisa* is said to yield a green dye, and also to be astringent enough to deserve the attention of tanners. The leaves of the common Teazel are united at their base so as to form round the stem a hollow in which water collects; hence the plant was called *Διψακος* or thirsty, and also obtained the name of Venus' Bath; and the superstitious fancied that the water thus collected from rains and dews was good for bleared eyes.

#### GENERA.

<i>Morina</i> , <i>Tournef.</i>	<i>Cephalaria</i> , <i>Schrad.</i>	<i>Knautia</i> , <i>L.</i>	<i>Sclerostemma</i> , <i>Schott.</i>
<i>Diotrothea</i> , <i>Vaill.</i>	<i>Lepicephalus</i> , <i>Lagase.</i>	<i>Trichera</i> , <i>Schrad.</i>	<i>Spongostemma</i> , <i>Rchb.</i>
<i>Asaphes</i> , <i>Spreng.</i>	<i>Cerionanthus</i> , <i>Schott.</i>	<i>Pterocephalus</i> , <i>Vaill.</i>	<i>Succisa</i> , <i>Coult.</i>
<i>Dipsacus</i> , <i>Tournef.</i>	<i>Succisa</i> , <i>Vaill.</i>	<i>Scabiosa</i> , <i>Röm et Schult.</i>	<i>Columbaria</i> , <i>Thuill.</i>
<i>Galedragon</i> , <i>Gray.</i>	<i>Pycnocomon</i> , <i>Wallr.</i>	<i>Asterocephalus</i> , <i>Vaill.</i>	

NUMBERS. GEN. 6. Sp. 150.

POSITION.—*Asteraceæ*.—*DIPSACACEÆ*.—*Valerianaceæ*.



## ORDER CLXXII. CALYCEACEÆ. Campanulidæ.

*Calycium*. R. Brown in *Trans. Linn. Soc. Lond.* 1810, p. 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

**DIAGNOSIS.**—*Campanulidæ*, with a 1-celled ovary, sessile ovules, short stamens, pedicels, and filaments, and a 1-celled ovary.

Herbaceous plants. Leaves alternate, without stipules. Flowers collected in heads, which are either terminal or opposite the leaves, surrounded by an involucre. Flowers sessile, hermaphrodite, or neuter. Calyx superior, of 5 unequal pieces. Corolla regular, valvate, funnel-shaped, with a long slender tube and 5 segments, each of which has 3 principal veins; glandular spaces below the stamens and alternate with them. Stamens 5, monadelphous; anthers combined by their lower half in a cylinder. Ovary inferior, 1-celled; ovule solitary, pendulous; style simple, smooth; stigma capitate. Fruit an indehiscent pericarp, usually crowned by the rigid spiny segments of the calyx. Seed solitary, pendulous, sessile; embryo in the axis; cotyledons alternate; radicle superior, longer than the plano-convex cotyledons.

A very small and curious Order, differing from Compositæ in nothing but their stamens, pendulous ovule, and half distinct anthers, and from Umbellales in their filaments being monadelphous and their anthers partly connate. They may therefore be considered to hold a middle station between those two Orders.

Such species as are known inhabit South America, partly extending to the adjacent districts, but more plentiful in South Chile. They are hitherto little known in Europe. They are described as ascending from the sea coast to mountain-tops, situated on the Andes.

They are not mentioned as possessing any useful qualities.

We are promised a review of this Order by Mr. Miers, in which the natural composition it has been investigated; and has proposed a classification with different genera, and drawings of all the species. The following list is proposed by Mr. Miers.

## GENERA.

*Nasturtium*, Miers.  
*Campanula*, Miers.  
*Campanula*, Miers.  
*Campanula*, Miers.

*Campanula*, Miers.  
*Campanula*, Miers.  
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*Campanula*, Miers.  
*Campanula*, Miers.  
*Campanula*, Miers.  
*Campanula*, Miers.

## NUMERUS SPECIES.

*Campanula*, Miers. 100.

**FIG. CCCLXXII.**—*Campanula*, Miers. 100. 1. A single flower. 2. A single flower. 3. A single flower. 4. A single flower. 5. A single flower. 6. A single flower. 7. A single flower. 8. A single flower. 9. A single flower. 10. A single flower. 11. A single flower. 12. A single flower. 13. A single flower. 14. A single flower. 15. A single flower. 16. A single flower. 17. A single flower. 18. A single flower. 19. A single flower. 20. A single flower. 21. A single flower. 22. A single flower. 23. A single flower. 24. A single flower. 25. A single flower. 26. A single flower. 27. A single flower. 28. A single flower. 29. A single flower. 30. A single flower. 31. A single flower. 32. A single flower. 33. A single flower. 34. A single flower. 35. A single flower. 36. A single flower. 37. A single flower. 38. A single flower. 39. A single flower. 40. A single flower. 41. A single flower. 42. A single flower. 43. A single flower. 44. A single flower. 45. A single flower. 46. A single flower. 47. A single flower. 48. A single flower. 49. A single flower. 50. A single flower. 51. A single flower. 52. A single flower. 53. A single flower. 54. A single flower. 55. A single flower. 56. A single flower. 57. A single flower. 58. A single flower. 59. A single flower. 60. A single flower. 61. A single flower. 62. A single flower. 63. A single flower. 64. A single flower. 65. A single flower. 66. A single flower. 67. A single flower. 68. A single flower. 69. A single flower. 70. A single flower. 71. A single flower. 72. A single flower. 73. A single flower. 74. A single flower. 75. A single flower. 76. A single flower. 77. A single flower. 78. A single flower. 79. A single flower. 80. A single flower. 81. A single flower. 82. A single flower. 83. A single flower. 84. A single flower. 85. A single flower. 86. A single flower. 87. A single flower. 88. A single flower. 89. A single flower. 90. A single flower. 91. A single flower. 92. A single flower. 93. A single flower. 94. A single flower. 95. A single flower. 96. A single flower. 97. A single flower. 98. A single flower. 99. A single flower. 100. A single flower.



## ORDER CCLXXIII. ASTERACEÆ.—COMPOSITES.

Compositæ, *Adans. Fam.* 2. 103. (1763); *Kunth in Humb. N. G. et Sp. vol. 4; Lessing, Synops. Compos. Royle's Illustr.* 245; *DC. Prodr. vol. 5, 4c.; Endl. Gen. exx.; Meisner, p. 174.*—Synanthereæ, *Rich. Anal.* (1808); *Cassini Dict. Sc. N. 10. 131.* (1818); *Ibid.* 60. 563. (1830).—Corymbifereæ, *Cynarocephalæ*, and *Cichoraceæ*, *Juss. Gen.* (1789).

DIAGNOSIS.—*Campanal Exogens*, with a 1-celled ovary, valvate corolla, syngenesious anthers, erect ovule, and no albumen.

Herbaceous plants or shrubs. Leaves alternate or opposite, without stipules, usually simple, but commonly much divided. Flowers (called florets) unisexual or hermaphrodite, collected in dense heads upon a common receptacle, surrounded by an involucre. Bracts either present or absent; when present, stationed at the base of the florets, and called paleæ of the receptacle. Calyx superior, closely adhering to the ovary, and undistinguishable from it; its limb either wanting or membranous, divided into bristles, paleæ, hairs, or feathers, and called pappus. Corolla monopetalous, superior, usually deciduous, either ligulate or funnel-shaped; in the latter case, 4- or 5-toothed, with a valvate æstivation. Stamens equal in number to the teeth of the corolla, and alternate with them; the anthers cohering into a cylinder. Ovary inferior, 1-celled, with a single erect ovule; style simple; stigmas 3, either distinct or united. Fruit a small, indehiscent, dry pericarp, crowned with the limb of the calyx. Seed solitary, erect; embryo with a taper inferior radicle; albumen none.

This is one of the most natural and extensive families of the vegetable kingdom, at all times recognised by its inferior 1-celled ovary, with an erect ovule, syngenesious stamens, and capitate flowers. Calycers and Teazelworts, neighbour-



Fig. CCCCLXXIII.

Fig. CCCCLXXIII.—*Centaurea Cyanus*. 1. a floret; 2. the anthers; 3. perpendicular section of young fruit; 4. ripe fruit; 5. floret of *Taraxacum Dens Leonis*.



ing Orders, also with the flowers in buds, are readily distinguished by their pedicels ovate, and the anthers being either wholly or partially distinct.

In preparation for the second volume, depending upon the availability of the literature, is the necessity of separating it into a number of sections having three components: the flora of what are regarded in the disk, and the fishes as the requirements. Cichlids are the group of which are all together, and Cyprinocéphale, all whose floras are themselves; to which has now been added another division, the *Amphibians*. Linnæus employed the use of the three for the purpose of defining groups, but this, for all other parts of his great Swedish Naturalist's Extended System, is

now abandoned; and yet it was not without much merit. The condition of the Order had at one time, thanks to the neglect of Linnean Botanists and the somewhat dissipated habits of more careful observers,—become a chaos, the like of which had not been seen since the days of the Bauhins; but in 1830 an arrangement of much merit was proposed by the German Botanist Lessing, and at a later period De Candolle, the elder applied his acute and logical mind to the re-organization of the Order. At the present day the method of the latter, essentially founded on that of Lessing, is universally followed. De Candolle himself stated it thus:—

Suborder I. TUBULIFLORÆ; that is to say, those in which the hermaphrodite florets, which also can be regarded as normal, are tubular, with 5, or rarely 4, equal teeth. Of these the following are distinguished by their stamens:

1. *Vernoniaceae*. Style cylindrical; its arms generally long and subulate, occasionally short and blunt, always covered all over with bristles.
2. *Eupatoriaceae*. Style cylindrical; its arms long and clavate, with a papillose surface on the outside of the end.
3. *Asteroidæ*. Style cylindrical; its arms linear, those on the outside, equally and finely fringed with the arms.
4. *Senecioidæ*. Style cylindrical; its arms linear, fringed at the point, generally trifurcate, but sometimes extended beyond the fringe with a sort of appendage of some sort.
5. *Cynarææ*. Style thickened upwards, and often fringed at the tumour.

Suborder II. LABELLIFLORÆ; that is to say, those in which the hermaphrodite florets, or at least the inner ones, are divided into two lips. Of these the following are distinguished by their stigmas:—

6. *Mutisiaceae*. Style cylindrical or somewhat (rarely) to some length thick, truncate, very convex on the outside, and tapered at the upper part by a few uniform hairiness, or absolutely bald.
7. *Nassauviaceae*. Style never tumid; the bract long, linear, acuminate, longer only at the point.

Suborder III. LIGULIFLORI; that is to say, those which resemble the Liguliflorae, etc.

8. Cichoraceæ.

[illegible]



But although it must be admitted that the divisions of Lessing, so nearly followed by De Candolle, are ingenious, and often founded on striking characters, yet Botanists will also allow that they are far from satisfying the mind, and that they can only at the best



Fig. CCCCLXXVI.

be looked upon as temporary devices for dealing with a most unmanageable and difficult subject. The Composite Order alone comprehends at the present day more species than Linnæus knew as belonging to the whole vegetable kingdom, and the time will come when this huge Order will be classified upon different principles. There can be no doubt that the genera are needlessly multiplied; a very little practice tells us that the genera collected under the signs above given do not in all cases exhibit those signs, as is evident from the figures executed under the eye of De Candolle himself; and we know that, in fact, genera find their place by considerations apart from those ostensibly put forward by De Candolle. In the meanwhile, the old Jussieuan Sub-orders Corymbiferae, Cynaraceae, and Cichoraceae, are unimpaired, and with the Bilabiata division, of the existence of which Jussieu was ignorant, constitute the immutable foundation of whatever future ingenuity may propose.

The Composite Order stands, as has been already stated, in most immediate affinity with Calycers and Teazelworts; but it is also closely allied to Bellworts and the rest of the Campanal Alliance. If the ovary were furnished with more than one cell, and there were many seeds in each cell, there would be little distinction from Lobeliads; and if Bellworts had syngenesious anthers and the latter characters in addition, they too would be almost identical. Indeed, the milky fluids of Bellworts and Lobeliads are of the same nature as in Cichoraceae.

Among the peculiarities of the Order is the presence of a marginal vein to each petal, of which the corolla is composed; this vein passes up the edge, reaches the point, and then turns down again, so as to form a line running down through the axis of each petal; so that a Composite corolla may have five veins opposite the re-entering angles, or ten opposite them in pairs, or fifteen, when, in addition to the last circumstance, the axile vein of each petal is completed in the way described. There may even be ten veins, or indeed twenty, by variations of this peculiarity, as a little reflection will make evident.

Decaisne has made some curious remarks upon the hairs of plants of this Order. In *Ruckeria* the pericarp is covered with papillae; on placing one of these papillae in water, it immediately separates into 2 lips, and thence emits 2 mucilaginous tubes, which issue forth like wires, spirally unrolling themselves, and finally much exceed the papillae from which they proceed. These tubes are apparently formed by a very considerable number of threads, placed one upon the other in the manner of a skein of thread. Various

Fig. CCCCLXXVI.—1. Tubular floret of *Webbia aristata*, with double pappus (Vernoniaceae, DC.); 2. tubular floret and stigma of *Anisochaeta mikanioides*, with pappus of 4 setae (Eupatoriaceae, DC.); 3. tubular floret of *Berthelotia lanceolata*, with silky pappus (Asteroidae, DC.); 4. Stigma of *Blumea senecioides* (Asteroidae, DC.); 5. ligulate floret and stigma of *Lipochaeta umbellata*; pappus of two unequal winged paler (Senecionideae, DC.); 6. stigma of *Dunantia achyranthes* (Senecionideae, DC.); 7. tubular floret with ventriose throat and the stigma of *Aplotaxis nepalensis* (Cynareae, DC.); 8. ligulate bilabiate floret of *Oreoseris lanuginosa* (Mutisaceae, DC.); 9. ligulate floret of *Brachyrhampus obtusus* (Cichoraceae, DC.).



other plants of the Lalatidham and Sarnathidham have been found to have similar hairs, and among them the common Green Leaf, whose various other leaves are clothed with them.—*Ann. Nat. Hist.* v. 179.

All parts of the world contain Composites, but in very different proportions. According to the calculations of Humboldt, they constitute  $\frac{1}{2}$  of the phanerogamic plants of France,  $\frac{1}{3}$  of Germany,  $\frac{1}{2}$  of England,  $\frac{1}{3}$  of North America,  $\frac{1}{4}$  of the region of America  $\frac{1}{2}$ ; upon the authority of Humboldt they only form  $\frac{1}{10}$  of the Flora of the north of New Holland, and did not come up in the collection of plants brought by Smith upon the western coast of Africa in 1795. Composites are very rare in India; they constitute rather more than  $\frac{1}{2}$  (*Presl.*); the same proportion holds in the Sandwich Islands (*Chapman*); but in Melville Island they are called from them by *James* a proportion nearly the same as that of the tropical parts of New Holland. It may be said, therefore, appear that Composites, as an Order, are subject to any very great increase of number or decrease corresponding with latitude. But much remains to be learned upon the subject. It is certain that *Chloisopsea* are most abundant in cold regions and *Caryophyllaceae* in hot ones; and that while in the northern parts of the world Composites are universally herbaceous plants, they become gradually woody, at least woody stems, as we approach the equator; most of them, of this sort, however, and the *Ericaceae* of St. Helena are chiefly trees. The *Bilbiaceae* genus are almost entirely American, and from the southern provinces beyond the tropics.

De Candolle gives the following as the result of his examination of the natural history of Compositae:—Out of 11523 of which he had any knowledge 775 were biennials, 2461 perennials, 2264 undershrubs from 4 to 4 feet high, 1000 trees from 4 to 15 feet high, 72 small trees, 4 large trees above 55 feet high, 61 woody lianes of which nothing further was known, 19 grasses or grasslets, and 1891 others of which nothing certain could be ascertained. These were distributed as follows:—in the South Sea Islands, 2224 in Africa, 1677 in Asia, 1042 in Europe, and 207 in America; of these the Cape of Good Hope possessed 5149, Malacca 172, Brazil 123, Florida 28, and Canada 676, the Levant 519, the Continent of India 501, north and central Europe 447, Europe at the Mediterranean 595, Australia 394. See also *Monographie des Compositées*, *Mémoires*, No. X.

M. Lasque estimates (*Mém. Botanique*, 1914) the number of Composite plants to 2500, and remarks "that they have steadily continued in increasing amount of all the described plants, in proportion as our knowledge of species has advanced. Thus Linnaeus had 735 Composites out of 8,500 species; in 1800 the proportion was 2000 to 27,000; De Candolle described 3723 in the year 1815, which was about a third, and now that the estimate of species has risen to 55,000, Composites plant species is 2500."

The uses to which Composites have been applied are so numerous and so general, that but the species have considerable resemblance to the nature of them, none. In these editions the statement made by De Cade in his celebrated *Worms* in 1729, that the *Phantes*, was taken as the basis of an enumeration of these, which has since been improved by others, and especially by Trichoptera, which appeared in the *Encyclopædie* is here followed with some additions and alterations.

A bitter matter, combined with a little oil, as well as a little mucilage, and some ethereal oil, to which in certain species is superadded starch in the roots, are the characteristics of Tubuliflorae, some of which are tonics, others stimulants, others emetics, according to the peculiar manner in which these and the other parts are used.

Among tonic, bitter, aromatic medicines the *Artemisia* species are reported to be of notice, the various species having been employed in medicine from the most remote antiquity. Of these, Wormwoods are the most celebrated, they have been employed in medicine from their employment as vermifuges, and are introduced in Hungary, &c. From thence and Pontica; *Saethermwood*, a fragrant plant, used in the preparation of beer, is the *A. Abrotanum*; Tarragon, celebrated for its fragrance in culinary medication of vinegar, is the *A. Dracunculus*; *A. Maticensis* (Mojensis) is intermediate in quality between Tarragon and Wormwood; *A. Moschata*, another *Artemisia* species, furnish between them the bitter aromatic liquor called *Artemisia Moschata*, a Persian species, is reported to have the odor of musk; *A. vulgaris* and other species yield the Mexican Chalk, a substance which is used to burn it upon parts affected with pest and other diseases. The leaves of *A. vulgaris* and *patana* are esteemed by the Indian doctors a valuable remedy against the ague, and sometimes used in antiseptic and anodyne preparations. *A. vulgaris* is much used in India a powerful deobstruent and antispasmodic. The flowers of several species of *Artemisia* constitute the drugs called Semen *Artemisiae*. These which form the principal part of the compound medicines called elechna, Contra and pauciflora. The flowers of *A. vulgaris* are used in the



kinds of Wormseed called *Semen Cinæ levanticum*, or *Semen cinæ in granis*. It is collected in the North-east of Persia. The *A. alba*, and other species, serve as nourishment to the herds of the Kirghese and Calmucks.—*Annales de Chem.* 1. 49. The flower-heads of *A. cærulescens*, a Mediterranean plant, are the anthelmintic known under the name of *Semen Seriphi*, or *Barbotine*; *A. camphorata* has a similar action, as also has *A. gallica*, called in France *Sanguerié* or *Sanguerite*. The nature of *Tansy*, *Tanacetum vulgare*, is not very different.

The *Achilleas*, or *Milfoils*, have an ethereal oil and a bitter, resinous, astringent matter in their foliage. *Achillea millefolium* is highly astringent, and the Highlanders are said to make of it an ointment, which dries and heals wounds.—*Hooker Brit. Fl.* p. 368. The *Achilleas setacea*, *nobilis*, and others, are slightly stimulating and tonic. *A. Agerratum*, a South of Europe species, is a very powerful stimulant; the French regard it as a vulnerary, and call it *Herbe au Charpentier*. The *Parmicias*, formerly considered *Achilleas*, are similar in their action. The heads of *P. nana*, *atrata* and *moschata*, are used in the Swiss Alps as tea; *P. moschata* is the basis of the aromatic liqueur called *Esprit d'Iva*; of *P. vulgaris*, the whole plant is pungent, provoking a flow of saliva; its dried leaves produce sneezing, but this is thought to be owing to their sharp marginal teeth; the root is aromatic.

The ethereal oil, so abundant in these plants, is sometimes acrid, sometimes bitter; it is more especially secreted in the flower-heads of many species, which are in that form employed for various purposes. First among them ranks *Chamomile* (*Anthemis nobilis*), a plant abounding on commons and similar wild places, where it is closely cropped by cattle: it is a well known stimulating tonic, and its warm infusion is employed to excite vomiting. The flower-heads of *Santolina fragrantissima* are extremely fragrant when dry,

and are sold in the shops of Cairo as a substitute for *Chamomile*, under the name of *Babouny* or *Zeysoom*. Forskahl says the fresh juice of the plant is applied in affections of the eyes. *Matricaria Chamomilla* and *Pyrethrum Parthenium* (*Feverfew*) have a similar action, but are not in general use; the smell of the latter is said to be peculiarly offensive to bees, which, it is added, may be easily kept at a distance by carrying a handful of the flower-heads.

Others seem to be offensive to other animals. We are assured by Prof. Cantraine that *Chrysanthemum Leucanthemum* is a certain remedy against fleas. The Bosnians place the plant in the bed of domestic animals, and the fleas are destroyed in a very short time.—*Bull. Ac. r. Brux.* viii. 234. In some cases the stimulating action is so much increased as to assume an acrid form. *Maruta foetida* is a weed, every part of which is foetid and acrid, blistering the skin when much handled; its decoction is a strong and active bitter, in the dose of a tea-cupful producing copious vomiting and sweating. With this may be associated *Anthemis tinctoria* and *Santolina Chamæcyparissus*, both obsolete remedies. In some instances this same ethereal oil acquires a remarkable pungency, as in *Anacyclus Pyrethrum*, the *Pellitory of Spain*, whose fleshy root when fresh produces on the



Fig. CCCCLXXVII.

Fig. CCCCLXXVII — *Chrysanthemum Leucanthemum*.



hands of those who gather it a quantity of *Pyrethrum* sold, obtained by a chemical process, its taste is hot, acrid, and permanent, and it is used as a powerful insecticide and emulant, especially as a tonic-stimulant in the various affections of the small intestine; indeed, this same action is found to exist in various species of *Pyrethrum*, such as *Pyrethrum*, *Tanacetum*, and others, which thus exerts a general property.

In some instances the odly secretion of *Compositæ* assumes a dangerous form. The most remarkable instance of this occurs in *Artemisia* growing in a place here called the gardens Mountain Tobacco; it is a strict plant, acting very powerfully as a tonic-stimulant agent; it is said, however, that this activity has been exaggerated. It has long been recommended in the cure of putrid fever, ague, palsy, consumption, &c. &c.; and in the Continent has obtained the name of *Paracelsa apocynifolia*. It has been named by De Tournefort that its flowers contain an essence of arsenic, but this is probably mistaken by Verrill, who asserts that the activity of the plant does not depend upon arsenic, but upon an extremely acrid, resinous matter. *Thymus* *Thymus*, *Thymus*, is another plant properties analogous to those of *Artemisia* occur in *Doricum* *Psidium*, but various species of the genus *Inda* or those allied to it. Of these the most remarkable is the *campane* (*Inda* *Helenium*), an aromatic plant whose root contains a white, mucous powder called *Inuline*, a volatile oil, a soft acrid resin, and a bitter substance, which is regarded as a tonic, diuretic, and diaphoretic, and has been used to disengage gallstones, affections, and other diseases. It furnishes the *Vin d'Ancien* of the French.

*Eupatorium* and its allies, in addition to the qualities just mentioned, exerts a moderate for them, are astringent in some cases, tonic and purgative in others. The action is the action of *Eupatorium* *caribaeum*, a common form of most plants. *E. caribaeum* is a powerful sudorific, and is said to be used a valuable repellent in the cure of venomous snakes. For this purpose it is used in Brazil. A quantity of the small leaves, which are to be frequently changed, is laid on the affected wound, and some spoonfuls of the expressed juice are then laid on the wound, and in the evening, if he is found to be free from the symptoms, particularly the swelling, which follows the wounds of venomous reptiles. *E. perfoliatum* has a very similar action. *Mikania opifera* is employed in the same way as the *Artemisia*; *M. cascarilla*. The famous vulgarity called *Matteo*, and said to be derived from *Mikania elongata* (See p. 315), is really, according to Mr. Hartweg, the *Hypericum* *perfoliatum*.\* *Mikania Guineo* has been stated by Humboldt to be called *V. Guineo* and to be much esteemed in Spanish America as a valuable antidote against the bite of serpents. But the power of this *Mikania* is denied in the most judicious terms by Humboldt, who suspects that the real *Guineo* antidote is some kind of *Artemisia*.

To these might be added a long list of plants belonging to the genus *Helianthus*, *Acanthospermum*, *Ageratum*, *Pluchea*, *Conoclinium*, *Taraxacum*, *Cnicus*, *Protophyllum*, *Blumea*, &c., the uses of which may be found in special works on the history of plants.

A few of these plants are employed as dyes. A beautiful scarlet is obtained from the corolla of the *Dahlia*; *Echta creta* stains black the hair of horses and birds.

*Cercaria furcata*, a half-succulent plant, inhabiting the moist earth (regions of S.W. Africa, yields in some abundance a brittle, resinous substance, which is called *Bdellium* when burnt, and has been called *African Bdellium*.

A bland oil abounds in the seeds of many species. Of these the most remarkable are *Guizotia oleifera* (formerly *Verbesina sativa*), extensively cultivated in India under the name of *Ram-til*; *Helianthus annuus* (the *Sunflower*); whose seeds, when pressed, give like seeds are very palatable and wholesome; and *Melissia sativa*, a Chinese plant here introduced with success into the agriculture of the drier parts of Europe. Its oil, expressed without heat, is described as transparent, yellow, fragrant, &c., and for the salads; its cake is said to be good for cattle; it produces, in dry climates, as much oil per acre as Poppy; in comparison with Olive as 32 to 72, compared as 32 to 32, and Olives as 32 to 16.—*Passage*.

In general the *Cynareæ* genera are characterized by a bitter, stimulating, tonic, and stimulating, diaphoretic, and diuretic; others have flowers and leaves used for the same

\* I have the following memorandum on this subject from Mr. Hartweg:—*Mikania opifera* is the name applied by the inhabitants of Quito to the *Hypericum* *perfoliatum*, which is the same plant in language. It forms a shrubby plant, and is a very common plant in the mountains of Quito, where its properties have been discovered and used. It is a native of the mountains of Quito, and its root name *Matteo* (little *Matthew*), which was applied to it, was derived from the fact that it was used by some shrub to his wound, which had the name of *Matteo*, and was called *Matteo*. The name has since been applied to the *Hypericum* *perfoliatum*, which has been found to be the same plant as the true *Matteo* of the inhabitants of Quito and the mountains. Every day the name of *Matteo* and *perfoliatum* have been used by the people of Quito, and the name of *Matteo* has been found them to agree exactly with his description of the plant.

\*\* I have also a small quantity of powdered bark of *Guizotia oleifera*, which is a very common plant, collected in Bolivia, where it is known by the name of *Guizotia*. From this of course I suspect that I find in the parcel, I suspect that it is the same plant.



of some the root abounds in gum, and in many the seeds are oily and purgative, without a trace of the aroma so generally prevalent in the Order.

*Centaurea Calcitrapa*, and especially *Cnicus Benedictus*, have been used as febrifuges, and it is asserted, with great success, though they are now banished from general practice. Similar qualities have been assigned to many others, especially to the *Bardanas* or *Burdocks*, *Lappa minor* and *major*; of these plants the root is reckoned tonic, aperient, sudorific, and diuretic; it has been used in the form of decoction in rheumatism and diseases of the skin; Sir Robert Walpole praised it as a gout medicine, and others have considered it an excellent substitute for *Sarsaparilla*; the fruit, which is bitter and slightly acrid, has been used as a diuretic.

*Carlina acaulis*, a meadow plant with a very short stem and large flower-heads, conspicuous for the long rays of the shining involucre, was formerly used in magical incantations; its bark abounds in resinous matter, and a strong-scented, bitter, caustic oil, which acts as a drastic purgative. Another species, *Carlina gummifera*, the *ἰζία* or *ἰζύνη* of the ancients, has from time immemorial been employed as an anthelmintic; its great fleshy root and its flower-heads also yield a gum which hardens into tears like *Mastich*; when fresh, the root is said to be noxious to both man and beast, but the fleshy receptacles are preserved with honey or sugar, and eaten. Similar qualities are found in an Arabian plant, supposed to be allied to *Cardopatum corymbosum*, whose roots are sold in the shops of the continental nations, under the name of *Costus*. But Dr. Falconer has ascertained that the *Costus* of the ancients is the root of his *Aucklandia Costus*, a plant inhabiting the moist open slopes surrounding the valley of Cashmere, at an elevation of 8000 or 9000 feet above the level of the sea. The roots have a strong aromatic pungent odour, are regarded as aphrodisiacs, and are burnt as incense in the temples. In Cashmere the plant is not held in repute as a medicine, but is chiefly employed for protecting bales of shawls from the attacks of moths. The modern Arabians consider the root of the *Artichoke* (*Cynara Scolymus*) an aperient; they call the gum of it *Kunkirzeed*, and place it among their emetics. Some of this race are used by dyers. *Safflower*, employed to produce a beautiful pink dye, and in the preparation of rouge, is the dried flowers of *Carthamus tinctorius*; its seeds are purgative, and have been used in dropsical cases. *Serratula tinctoria* also furnishes a yellow or green dye. The flowers of *Calendula officinalis*, or *Pot Marigold*, are used to adulterate *Saffron*; it was formerly cultivated as an aperient and sudorific, but is now forgotten. We learn from Col. Sykes that the seeds of *Carthamus persicus* produce a useful oil, edible when fresh; that they are eaten whole as food in times of scarcity, and also the leaves as greens; the oil-cake of this plant is said, on the same authority, to be highly nourishing to milch cattle.

Few of the *Labiatifloral* Sub-order appear to be of any importance. The leaves of *Printzia aromatica* are used at the Cape of Good Hope as a substitute for tea; those of *Anandria discoidea* are mucilaginous and bitter, and are employed in China in dyspnoea, as those of *Tussilago Farfara* have been in Europe; *Trixis brasiliensis* is taken in decoction as a remedy for excessive menstruation; *Moscharia pinnatifida* smells of musk, and *Flotovia diacanthoides* forms a small tree with a hard white wood.

The *Ligulifloral* genera are of far more importance. In all cases they abound in a milky, bitter, astringent, or narcotic juice. Among the bitters the most useful is *Chicory*, *Cichorium Intybus*, whose tap roots are cultivated as a substitute for Coffee, which they certainly improve when torrefied and added in small quantities.

*Taraxacum Dens Leonis*, the common *Dandelion* (*Dent de Lion*), appears to be of considerable medicinal importance as an anodyne, deobstruent, aperient, and diuretic; in cases of chronic diarrhoea it has been found very useful, according to Mr. Houlton. M. Poley has obtained from it *Taraxacine* in arborescent or star-shaped crystals.—*Pharm. Journ.* 1. 425. *Nabalus serpentaria* and *albus* are two North American plants, whose bitter milky roots are held in repute as a remedy for Rattlesnake bites; *Mulgedium floridanum* is called, because of its bitterness, *Gall of the Earth*. The *Lettuces*, *Lactuca*, are all narcotic; *Lactuca virosa*, *Scariola*, and *sylvestris* yield an extract resembling opium in its qualities; the garden Lettuce, *L. sativa*, furnishes the narcotic drug called *Lactucarium*. But, according to Aubergier, the best *Lactucarium* is obtained from *Lactuca altissima*.—*Comptes R.* xv. 923. A similar gum, which they call *κολλα*, is obtained in Lemnos from *Chondrilla juncea*. In a few species the juice is acrid. *Zaeryntha verrucosa* is used in the Mediterranean as a phagedenic, and *Crepis laccra* is held in the kingdom of Naples to be a venomous plant.

In a small number of species of this Order nutritive matter is collected in sufficient abundance to render them worthy of notice as esculents. The most important in that way are *Cardoons*, the blanched leaf-stalks and stems of *Cynara Cardunculus*; *Artichokes* obtained from the succulent receptacles of *Cynara Scolymus*; *Scorzonera* and *Salsafy*, the roots of *Scorzonera hispanica* and *Tragopogon porrifolius*; *Endive*, the blanched leaves of *Cichorium Endivia*; *Succory*, a similar preparation of *Cichorium Intybus*;







Diplopappus, *DC.*  
*Asterosperma*, Less.  
 Rhinactina, *Less.*  
 Nictostrum, *DC.*  
 Distasis, *DC.*

## ERIGEREÆ.

Melanodendron, *DC.*  
 Leptocoma, *Less.*  
 Vittadinia, *A. Rich.*  
 Fullartonia, *DC.*  
 Polyactidium, *DC.*  
*Polyactis*, *Less.*  
*Stenactis*, *Cass.*  
 Heterochaeta, *DC.*  
 Therogeron, *DC.*  
 Erigeron, *DC.*  
*Leptostelma*, *Don.*  
*Terranea*, *Colla.*  
*Trimorphæa*, *Cass.*  
 Rhynchospermum, *Rnw.*  
 Microgyne, *Less.*

## HETEROPAPPEÆ.

Simblocine, *DC.*  
 Heteropappus, *Less.*  
 Phalacroloma, *Cass.*  
 Minuria, *DC.*  
 Stenactis, *Nees.*  
 Gymnostephium, *Less.*  
 Charieis, *Cass.*  
*Kaulfussia*, *Nees.*  
 Chætopappa, *DC.*  
*Chætophora*, *Nutt.*  
 Boltonia, *Herit.*  
 Perityle, *Benth.*  
 Sommerfeltia, *Less.*

## BELLIEÆ.

Calotis, *R. Br.*  
 Hunefeldia, *Walp.*  
 Asteromœa, *Blume.*  
 Bellium, *L.*

## BELLIDEÆ.

Bellis, *L.*  
*Kyberia*, *Neck.*  
 Seubertia, *Wats.*  
 Brachycome, *Cass.*  
*Brachystephium*, *Less.*  
 Paquerina, *Cass.*  
 Lagenophora, *Cass.*  
*Lagenifera*, *Cass.*  
*Microcalia*, *A. Rich.*  
 Ixauchenus, *Cass.*  
 Myriactis, *Less.*  
*Botryadenia*, *Fisch.*  
 Garuleum, *Cass.*  
 Keeria, *DC.*  
 Aphanostephus, *DC.*

## GYMNOSPERMEÆ.

Xanthocoma, *H. B. K.*  
 Xeranthamnus, *DC.*  
 Anaglypha, *DC.*  
 Gymnosperma, *Less.*  
*Sclloa*, *Spreng.*

## ACHYRIDEÆ.

Brachyris, *Nutt.*  
*Brachyachyris*, *Spreng.*  
 Amphipappus, *T. et Gr.*  
 Hemiachyris, *DC.*  
 Lepidophyllum, *Cass.*  
 Grindelia, *Willd.*  
 Demetria, *Lagasc.*  
 Donia, *R. Br.*  
 Aurelia, *Cass.*  
 Centauridium, *Torrey.*

## HETEROTHECEÆ.

Heterotheca, *Cass.*  
*Calycium*, *Ell.*  
*Plyocoma*, *Don.*  
 Bradburia, *Torrey.*  
 Dieteria, *Nutt.*  
*Sideranthus*, *Nutt.*  
*Pappochroma*, *Nutt.*

## PSIADIEÆ.

Erato, *DC.*  
 Woodvillea, *DC.*  
 Psiadia, *Jacq.*  
*Elphæga*, *Cass.*  
*Thovarsia*, *Vent.*  
 Aliz, *Commers.*  
*Glutinaria*, *Commers.*  
 Frivaldia, *Endl.*  
*Microglossa*, *DC.*  
 Nidorella, *Cass.*  
 Homochroma, *DC.*  
 Neja, *D. Don.*

## CHRYSOPSIDEÆ.

Chrysopsis, *Nutt.*  
*Thypogon*, *Rafin.*  
 Pityopsis, *Nutt.*  
 Fresenia, *DC.*

## SOLIDAGINEÆ.

Bigelowia, *DC.*  
 Brachychæta, *Torrey.*  
 Chrysoma, *Nutt.*  
 Chrysotamnus, *Nutt.*  
 Solidago, *L.*  
*Virga-aurea*, *Tournef.*  
 Doria, *Adans.*  
 Euthamia, *DC.*  
 Amphirapis, *DC.*  
 Isopappus, *Torrey.*  
 Homopappus, *Nutt.*  
*Myrianthus*, *Nutt.*  
*Actinophora*, *Nutt.*  
 Stenotus, *Nutt.*  
 Commidendrum, *Burch.*  
 Steiractis, *DC.*  
 Rochonia, *DC.*  
 Prionopsis, *Nutt.*  
 Haplopappus, *Cass.*  
*Aplapappus*, *Cass.*  
*Diplopappus*, *Less.*  
 ? *Hoorbeckia*, *Cornelis.*  
 ? *Sideranthus*, *Fraser.*

Ericameria, *Nutt.*  
 Pyrocoma, *Hook.*  
*Chromochæta*, *DC.*  
 Macrocnema, *Nutt.*  
 Lessingia, *Chem.*  
 Isocoma, *Nutt.*  
 Linosyris, *Lobel.*  
*Crinitaria*, *Less.*  
 Crinita, *Mönch.*  
 Chrysocoma, *Cass.*  
 Ammodia, *Nutt.*  
 Eriocarpum, *Nutt.*  
 Pteronia, *L.*  
*Sepinia*, *DC.*  
*Henanthus*, *Less.*  
*Puchydermis*, *DC.*  
*Pterophorus*, *DC.*  
*Pterophora*, *Neck.*  
 Pentachæta, *Nutt.*

## SOLENOGYNEÆ.

Duhaldea, *DC.*  
 Microtrichia, *DC.*  
 Nolletia, *Cass.*  
 Sarcanthemum, *Cass.*  
 Leptothamnus, *DC.*  
 Chroilema, *Bernh.*  
 Solenogyne, *Cass.*

## SPHERANTHEÆ.

Blepharisperrum, *Wight.*  
 Leucoblepharis, *Arn.*  
 Athroisma, *DC.*  
 Sphaeranthus, *Vaill.*  
*Cuspidella*, *DC.*  
*Polycephalos*, *DC.*  
*Oligolepis*, *Cass.*

## GRANGEINEÆ.

Dichrocephala, *DC.*  
*Centipeda*, *Less.*  
 Grangea, *Adans.*  
*Leptoderris*, *DC.*  
 Pyrarda, *DC.*  
 Cyathocline, *Cass.*  
 Lestadia, *Kunth.*  
 Gymnarrhena, *Desf.*  
*Gymnarhea*, *Steud.*  
 Frankia, *Steud.*

## CONYZEÆ.

Thespis, *DC.*  
 Karelinia, *Less.*  
 Berthelotia, *DC.*  
 Lænecia, *Cass.*  
 Conyza, *Less.*  
*Dimorphanthus*, *Cass.*  
*Eschenbachia*, *Mönch.*  
*Fimbrillaria*, *Cass.*  
 Leucopodium, *Gardn.*  
 Phagnalon, *Cass.*  
 Chionolœna, *DC.*  
 Elachothamnus, *DC.*  
 Parastrephia, *Nutt.*

## BACCHARIDEÆ.

Polypappus, *Less.*  
 Baccharis, *L.*  
 Molina, *Ruiz et Pav.*  
*Sergillus*, *Gärtn.*  
 Pingraea, *Cass.*  
 Tursenia, *Cass.*  
 Arrhenachne, *Cass.*  
 Stephananthus, *Lehm.*

## TARCHONANTHEÆ.

Brachylœna, *R. Br.*  
*Oligocarpa*, *Cass.*  
 Tarchonanthus, *Linn.*  
 Henotogyne, *DC.*

## PLUCHEINEÆ.

Blumea, *DC.*  
 Pluchea, *Cass.*  
*Stylimus*, *Rafin.*  
*Gynnemus*, *Rafin.*  
*Leptogyne*, *Ell.*  
*Chlenobolus*, *Cass.*  
 ? *Placus*, *Lour.*  
 Hebeophora, *DC.*  
 Pterocaulon, *Ell.*  
 Monteleles, *Labill.*  
 Tessaria, *Ruiz et Pav.*  
*Gynheteria*, *Willd.*  
*Gyneteria*, *Spr.*  
 ? *Phalacromesum*, *Cas.*  
 Monarrhenus, *Cass.*  
*Mahometia*, *DC.*  
 Cyliandrocline, *Cass.*  
*Lepidopogon*, *Tausch.*  
 Evax, *Gärtn.*  
*Filago*, *Willd.*  
*Gnaphalium*, *Vaill.*  
 Filaginopsis, *Torr.*  
 Diaperia, *Nutt.*  
 Stylocline, *Nutt.*  
 Micropsis, *DC.*  
 Calymnandra, *Torr.*  
 Micropus, *L.*  
*Gnaphalodes*, *Tournef.*  
*Psilocarpa*, *Nutt.*

Epaltes, *Cass.*  
*Ethulia*, *Gärtn.*  
 Denekia, *Thunb.*  
 Dipterocome, *F. et M.*

## INULEÆ.

Rhanterium, *Desf.*  
 Codonocephalum, *Fenzl.*  
 Inula, *Gärtn.*  
*Corvisartia*, *DC.*  
 Bubonium, *DC.*  
 Enula, *Duby.*  
 Cappa, *DC.*  
 Limbarda, *DC.*  
 Erithes, *Gray.*  
 Schizogyne, *Cass.*  
 Varthemia, *DC.*  
 Vicoa, *Cass.*  
 Pentanema, *Cass.*  
 Francœuria, *Cass.*  
*Duchesnea*, *Cass.*  
 Asteridea, *Lindl.*  
 Iphionia, *DC.*  
 Jasionia, *Cass.*  
*Chiliadenus*, *Cass.*  
*Myriadenus*, *Cass.*  
*Allagopappus*, *Cass.*  
 Vierœa, *Webb.*  
 Pulicaria, *Gärtn.*  
*Tubilium*, *Cass.*  
 Strabonia, *DC.*  
 Pegoletia, *Cass.*  
 Minyrothamnus, *DC.*  
 Cypselodontia, *DC.*  
 Geigeria, *Griess.*  
*Zephyria*, *Spreng.*  
 Dizonium, *Willd.*  
 Hochstetteria, *DC.*

## CÆSULINEÆ.

Cæsulia, *Rozeb.*

## BUPHTHALMEÆ.

Buphthalmum, *Neck.*  
 Telekia, *Baumg.*  
 Molpadia, *Cass.*  
 Astericus, *Mönch.*  
 Nauplius, *Cass.*  
 Pallenis, *Cass.*  
 Athalium, *Neck.*  
 Anvillea, *DC.*  
 Ceruana, *Forsk.*  
 Cryptadia, *Lindl.*

## ECLIPTEÆ.

Borrichia, *Adans.*  
 Diomedea, *Cass.*  
 ? *Odontospermum*, *Nk*  
 Eclipta, *Linn.*  
*Microtelium*, *Forsk.*  
 Blainvillea, *Cass.*  
 Uacœa, *Cass.*  
 Salmea, *DC.*  
 Hopkirkia, *Spreng.*  
 Dahlia, *Cav.*  
 Georgina, *Willd.*  
 Georgia, *Spreng.*  
 Leptocarpa, *DC.*  
 Siegesbeckia, *Linn.*  
 Sokkuria, *Mönch.*  
 Sabazia, *Cass.*  
 Cryphiospermum, *Palis.*  
 Wahlenbergia, *Schum.*

## IV. SENECONIDEÆ.

## EUXENIEÆ.

Euxenia, *Cham.*  
 Ogiera, *Spreng.*  
 Podanthus, *R. Br.*







*Achyropappus*, *H. B. K.*  
*Chamaestephanum*, *W.*  
*Schkuhria*, *Roth.*  
*Tetracarpum*, *Mönch.*  
*Mieria*, *Llav. et Lex.*  
*Amblyopappus*, *Hooker.*  
*Florestina*, *Cass.*  
*Lepitopappus*, *Fl. mex.*  
*Actinolepis*, *DC.*  
*Bahia*, *DC.*  
*Eriophyllum*, *Lagase.*  
*Trichophyllum*, *Nutt.*  
*Phialis*, *Spreng.*  
*Richteria*, *Karstén.*  
*Oxyleris*, *Benth.*  
*Macrocephalus*, *Nutt.*  
*Macrocarphus*, *Nutt.*  
*Hymenopappus*, *Herit.*  
*Rothia*, *Lam.*  
*Chenactis*, *DC.*  
*Polypteris*, *Nutt.*  
*Espejoa*, *DC.*  
*Cercostylus*, *Less.*  
*Polypteris*, *Less.*  
*Güntheria*, *Spreng.*  
*Hopkirkia*, *DC.*  
*Hymenoxis*, *Cass.*  
*Styleria*, *Nutt.*  
*Cephalophora*, *Cav.*  
*Gramia*, *Hook.*  
*Actinella*, *DC.*  
*Actinea*, *Cass.*  
*Dugaldia*, *Cass.*  
*Ptilipida*, *Raf.*  
*Cancerina*, *Karstén.*  
*Jaumea*, *Pers.*  
*Kleinia*, *Juss.*  
*Burrielia*, *DC.*  
*Ptilomeris*, *Nutt.*  
*Dichæta*, *Nutt.*  
*Picradenia*, *Hook.*  
*Helenium*, *L.*  
*Helenia*, *L.*  
*Brassavola*, *Adans.*  
*Tetradus*, *DC.*  
*Mesodetra*, *Rafin.*  
*Amblyolepis*, *DC.*  
*Rosilla*, *Less.*  
*Trichinetia*, *Endl.*  
*Schomburgkia*, *DC.*  
*Bacubæa*, *DC.*  
*Heeria*, *Fisch. et Mey.*  
*Callichroa*, *Fisch. et Mey.*  
*Calliachyris*, *Torr. et Gr.*  
*Oxyopappus*, *Benth.*  
*Rancagua*, *Pæpp. et Endl.*  
*Lasthenia*, *Cass.*  
*Argyroxiphium*, *DC.*  
*Argyrophyton*, *Hook.*  
*Pleurphyllum*, *Hook. fil.*

## GALINSOGEÆ.

*Lemmatium*, *DC.*  
*Caleacte*, *Less.*  
*Calydermos*, *Lagase.*  
*Calebrachys*, *DC.*  
*Meyeria*, *DC.*  
*Callilepis*, *DC.*  
*Calea*, *R. Br.*  
*Caleacte*, *DC.*  
*Moçima*, *Lagase.*  
*Leontophthalmum*, *Less.*  
*Allocaulus*, *H. B. K.*  
*Alloispermum*, *Willd.*  
*Vargasia*, *DC.*  
*Galinsoga*, *Ruiz et Pav.*  
*Galinsogæa*, *Zuccar.*  
*Wiborgia*, *Roth.*  
*Sogalina*, *Cass.*  
*Galinsoga*, *Less.*  
*Sogalina*, *Steud.*  
*Ptilostephium*, *H. B. K.*  
*Tridax*, *L.*  
*Blepharipappus*, *Hook.*  
*Ptilonella*, *Nutt.*

*Eriopappus*, *Arn.*  
*Marschallia*, *Schreb.*  
*Persoonia*, *Michx.*  
*Trattinnickia*, *Pers.*  
*Athanasia*, *Walt.*  
*Phytocymopsis*, *Juss.*  
*Dubautia*, *Gaudich.*

## SPHENOGYNEÆ.

*Sphenogyne*, *R. Br.*  
*Oligacron*, *Cass.*  
*Spermophylla*, *Neck.*  
*Thelythamnus*, *Less.*  
*Xerolepis*, *DC.*  
*Ursinia*, *Gærtn.*  
*Amida*, *Nutt.*  
*Lagophylla*, *Nutt.*  
*Harpacarpus*, *Nutt.*  
*Madia*, *Molin.*  
*Madarella*, *Nutt.*  
*Biotia*, *Cass.*  
*Silphiosperma*, *Steetz.*  
*Madaria*, *DC.*  
*Madriopsis*, *Nutt.*  
*Hemizonia*, *DC.*  
*Amaraia*, *Benth.*  
*Tollatia*, *Endl.*  
*Oxyura*, *DC.*  
*Hartmannia*, *DC.*  
*Madaroglossa*, *DC.*  
*Lajia*, *Hook. et Arn.*  
*Lepidostephanus*, *Bartl.*  
*Anisocarpus*, *Nutt.*  
*Osmadenia*, *Nutt.*  
*Calycadenia*, *DC.*

## ANTHEMIDEÆ.

*Œdera*, *DC.*  
*Eumorphia*, *DC.*  
*Aganippea*, *DC.*  
*Heliogenes*, *Benth.*  
*Epallage*, *DC.*  
*Anthemis*, *DC.*  
*Chamaemelum*, *DC.*  
*Marcelia*, *Cass.*  
*Maruta*, *Cass.*  
*Periderma*, *Webb*  
*Lugoa*, *DC.*  
*Lyonetia*, *Cass.*  
*Anacyclus*, *Pers.*  
*Hiortia*, *Neck.*  
*Cyrtolepis*, *Less.*  
*Ormenis*, *Cass.*  
*Cladanthus*, *Cass.*  
*Lepidophorum*, *Neck.*  
*Parnicea*, *Tournef.*  
*Achillea*, *Neck.*  
*Diotis*, *Desf.*  
*Gnaphalium*, *Tournef.*  
*Otanthus*, *Link.*  
*Santolina*, *Tournef.*  
*Chamaecyparissus*, *DC.*  
*Babounya*, *DC.*  
*Nablonium*, *Cass.*  
*Lasiospermum*, *Lagase.*  
*Lanipila*, *DC.*  
*Matzeca*, *Spreng.*

## CHRYSANTHEMEÆ.

*Steiroglossa*, *DC.*  
*Lidbeckia*, *Berg.*  
*Gamolepis*, *Less.*  
*Lasthenia*, *DC.*  
*Hologymne*, *Bartl.*  
*Psilothamnus*, *DC.*  
*Jacquemontia*, *Belang.*  
*Spiridanthus*, *Fenzl.*  
*Coinogyne*, *Less.*  
*Egletes*, *Less.*  
*Xerophus*, *Cass.*  
*Eyselia*, *Rchb.*  
*Venegasia*, *DC.*  
*Leucopsidium*, *DC.*

*Nanthocephalum*, *Willd.*  
*Phymaspermum*, *Less.*  
*Hisutsua*, *DC.*  
*Brachanthemum*, *DC.*  
*Nananthea*, *DC.*  
*Leucanthemum*, *Tournef.*  
*Phalacrodiscus*, *Less.*  
*Phalacroglottum*, *DC.*  
*Diabasis*, *DC.*  
*Enuchoglossum*, *DC.*  
*Phalacrocarpum*, *DC.*  
*Prolongoa*, *Boiss.*  
*Adenachena*, *DC.*  
*Matricaria*, *L.*  
*Pyrethrum*, *Gærtn.*  
*Gymnocline*, *Cass.*  
*Xanthoglossa*, *DC.*  
*Coleostephus*, *Cass.*  
*Tridactylina*, *DC.*  
*Dendranthema*, *DC.*  
*Allardia*, *Decaisne.*  
*Chrysanthemum*, *DC.*  
*Ismelia*, *Cass.*  
*Pinardia*, *Cass.*  
*Glebionis*, *Cass.*  
*Pinardia*, *DC.*  
*Centrospermum*, *Sprn.*  
*Heteranthemis*, *Schott.*  
*Centrachæna*, *Schott.*  
*Spermoptera*, *DC.*  
*Mayarsa*, *DC.*

*Preauxia*, *C. H. Schultz.*  
*Monoptera*, *C. H. Schultz.*  
*Stigmatothea*, *C. H. S.*  
*Argyranthemum*, *Webb.*  
*Dimorphotheca*, *Vaill.*  
*Meteoria*, *DC.*  
*Gattenhofia*, *Neck.*  
*Cardispermum*, *Traut.*  
*Lestibodia*, *DC.*  
*Blarinum*, *DC.*  
*Castalis*, *DC.*  
*Rutidocarpæa*, *DC.*  
*Arnoldia*, *DC.*  
*Triplocarpæa*, *DC.*  
*Acanthotheca*, *DC.*  
*Monolopia*, *DC.*  
*Steirodiscus*, *Less.*  
*Schistostephium*, *Krebs.*  
*Chlamysperma*, *Less.*  
*Villanova*, *Lagase.*  
*Brachymeris*, *DC.*  
*Brachystylis*, *E. M.*  
*Jacosta*, *E. Mey.*

## COTULEÆ.

*Lapeyrousia*, *Thunb.*  
*Peyrousia*, *DC.*  
*Otochlamys*, *DC.*  
*Cotula*, *Gærtn.*  
*Baldingera*, *Neck.*  
*Cenocline*, *Koch.*  
*Strongylosperma*, *Less.*  
*Cenia*, *Commers.*  
*Lancisia*, *Gærtn.*  
*Homalotes*, *DC.*  
*Aromia*, *Nutt.*

## ATHANASIEÆ.

*Lonas*, *Adans.*  
*Gonospermum*, *Less.*  
*Metagnanthus*, *Endl.*  
*Hymenolepis*, *Cass.*  
*Holophyllum*, *Less.*  
*Pristocarpa*, *E. Mey.*  
*Bembecodium*, *Kunz.*  
*Athanasia*, *Cass.*  
*Saintmorysia*, *Endl.*  
*Morysia*, *Cass.*

## ARTEMISIEÆ.

*Stilpnophytum*, *Less.*  
*Mesolobium*, *DC.*  
*Lepidotheca*, *Nutt.*

*Artemisia*, *L.*  
*Dracunculus*, *Bess.*  
*Oligosporus*, *Cass.*  
*Scriphidium*, *Bess.*  
*Scriphida*, *Less.*  
*Abrotanum*, *Tournef.*  
*Absinthium*, *Tournef.*  
*Crossostephium*, *Cass.*  
*Tanacetum*, *Linn.*  
*Psanactum*, *Neck.*  
*Broechia*, *DC.*  
*Hippioides*, *DC.*  
*Sphaeromeria*, *Nutt.*  
*Plagiis*, *Herit.*  
*Balsamita*, *Less.*  
*Adenosolen*, *DC.*  
*Marasmodes*, *DC.*  
*Pentzia*, *Thunb.*  
*Chlamydotheca*, *Ehrenb.*  
*Myriogyne*, *Less.*  
*Sphaeromorphæa*, *DC.*  
*Machlis*, *DC.*

## HIPPIEÆ.

*Abrotanella*, *Cass.*  
*Trineuron*, *Hook. fil.*  
*Ceratella*, *Hook. fil.*  
*Leptinella*, *Cass.*  
*Plagiocylus*, *Arnott.*  
*Soliva*, *Ruiz et Pav.*  
*Gymnostyles*, *Juss.*  
*Solivaca*, *Cass.*  
*Hippia*, *L.*

## ERIOCEPHALEÆ.

*Erioccephalus*, *L.*  
*Monochæna*, *Cass.*  
*Cryptogyne*, *Cass.*

## ANGIANTHEÆ.

*Styloneurus*, *Labill.*  
*Ogerostylus*, *Cass.*  
*Actinobole*, *Endl.*  
*Hyalolepis*, *DC.*  
*Phyllocalymma*, *Benth.*  
*Angianthus*, *Wendl.*  
*Cassinia*, *R. Br.*  
*Hirnelia*, *Cass.*  
*Cylindrosorus*, *Benth.*  
*Skirrhophorus*, *DC.*  
*Eriocladium*, *Lindl.*  
*Pogonolepis*, *Steetz.*  
*Myriocephalus*, *Benth.*  
*Gnephosis*, *Cass.*  
*Pachysorus*, *Steetz.*  
*Calocephalus*, *R. Br.*  
*Leucophyta*, *R. Br.*  
*Craspedia*, *Forst.*  
*Richea*, *Labill.*  
*Pycnosorus*, *Benth.*  
*Chrysocoryne*, *Endl.*  
*Crossocepis*, *Benth.*

## CASSINIEÆ.

*Ammobium*, *R. Br.*  
*Ixodia*, *R. Br.*  
*Rhynea*, *DC.*  
*Cassinia*, *R. Br.*  
*Chromochiton*, *Cass.*  
*Achromolæna*, *Cass.*  
*Chthonocephalus*, *Steetz.*

## HELICHRYSÆÆ.

*Humea*, *Smith.*  
*Calomeria*, *Vent.*  
*Agathomeris*, *Delau.*  
*Razumovia*, *Spreng.*  
*Crossocepis*, *Less.*  
*Pithocarpa*, *Lindl.*  
*Quinetia*, *Cass.*  
*Rutidosis*, *DC.*  
*Anisolepis*, *Steetz.*







*Chamaeleon*, DC.  
*Carlavizita*, DC.  
*Atractylis*, L.  
*Crocodylodes*, Vail.  
*Acaena*, Cass.  
*Anactis*, Cass.  
*Cirsium*, DC.  
*Spadactis*, Cass.  
*Thevenotia*, DC.  
*Cousinia*, Cass.  
*Aneathia*, DC.  
*Auchera*, DC.  
*Polytaxis*, Bunge.

## CENTAURIEÆ.

*Amberboa*, Pers.  
*Chryseis*, Less.  
*Goniocaulon*, DC.  
*Cyanopsis*, Cass.  
*Cyanastrum*, Cass.  
*Cyanopsis*, Cass.  
*Lacellia*, DC.  
*Voluntaria*, Cass.  
*Volutarella*, Cass.  
*Chryseis*, Cass.  
*Pararhysis*, DC.  
*Phacopappus*, DC.  
*Psephellus*, Fisch.  
*Amblyopogon*, Fisch.  
*Xanthopsis*, DC.  
*Zoegea*, L.  
*Microlonchus*, DC.  
*Mantisalca*, Cass.  
*Uralpis*, DC.  
*Tricholepis*, DC.  
*Achyropappus*, Bieb.  
*Ochrotopappus*, Endl.  
*Alaphalantias*, Endl.

*Tomanthea*, DC.  
*Crupina*, Cass.  
*Centaurea*, Less.  
*Crocodilum*, DC.  
*Calcitrapa*, DC.  
*Cyanus*, DC.  
*Centaureum*, DC.  
*Phrygia*, Gray.  
*Hypophaeum*, Gr.  
*Polyacantha*, Gr.  
*Leucantha*, Gray.  
*Hylea*, DC.  
*Microlophus*, Cass.  
*Piptoceras*, Cass.  
*Chartolepis*, Cass.  
*Phatolepis*, Cass.  
*Callicephalus*, C. A. M.  
*Platylophus*, Cass.  
*Jacea*, Cass.  
*Pterolophus*, Cass.  
*Leptanthus*, DC.  
*Stenolophus*, Cass.  
*Etheopappus*, DC.  
*Stizolophus*, DC.  
*Plectrocephalus*, DC.  
*Psephellus*, Cass.  
*Heterolophus*, Cass.  
*Cheirolophus*, DC.  
*Melanoloma*, Cass.  
*Odonolophus*, Cass.  
*Lopholoma*, Cass.  
*Spilacon*, Cass.  
*Acrolophus*, Cass.  
*Acrocentron*, Cass.  
*Hymenocentron*, Cass.  
*Verutina*, Cass.  
*Mesocentron*, Cass.  
*Triplocentron*, Cass.

*Corethrospis*, DC.  
*Podia*, Neck.  
*Philostizus*, Cass.  
*Pectinistrum*, Cass.  
*Alophium*, Cass.  
*Cnicus*, Vail.  
*Carbeni*, Adans.  
*Tetramorpha*, DC.  
**CARTHAMEÆ.**  
*Kentrophyllum*, Neck.  
*Hohenwarta*, West.  
*Heraacantha*, Lk.  
*Atractylis*, Vail.  
*Odontognatia*, DC.  
*Thamnacantha*, DC.  
*Carthamus*, Tournef.  
*Onobroma*, DC.  
*Carduncellus*, Adans.

## SILYBEEÆ.

*Silybum*, Vail.  
*Galactites*, Monch.  
*Tyrimnus*, Cass.

## CARDUINEÆ.

*Onopordon*, Vail.  
*Acanos*, Adans.  
*Cynara*, Vail.  
*Spanioptilon*, Less.  
*Carduus*, Gärtn.  
*Clavena*, DC.  
*Picnemon*, Lobel.  
*Acarna*, Vail.  
*Picnocomon*, Dalech.  
*Cirsium*, Tournef.  
*Cnicus*, Schreb.

*Breca*, Less.  
*Lophiolepis*, Cass.  
*Odontolepis*, Boiss.  
*Eriolepis*, Cass.  
*Epitrachys*, DC.  
*Orthocentrum*, Cass.  
*Corynotrichum*, DC.  
*Cephalonoplos*, Neck.  
*Onotrophe*, Cass.  
*Erythrokena*, Sweet.  
*Chamaepeuce*, Alpin.  
*Cirsium*, Less.  
*Ptilostemon*, Cass.  
*Lamyra*, Cass.  
*Platyrhaphium*, Cass.  
*Notobasis*, Cass.  
*Echenais*, Cass.  
*Lappa*, Tournef.

## SERRATULEÆ.

*Acroptilon*, Cass.  
*Rhaponticum*, DC.  
*Hookia*, Neck.  
*Centaureum*, Hall.  
*Stemmacantha*, Cass.  
*Cestrinus*, Cass.  
*Leuzea*, DC.  
*Rhacoma*, DC.  
*Fornicum*, Cass.  
*Malacocephalus*, Tsch.  
*Alfredia*, DC.  
*Serratula*, DC.  
*Sarreta*, DC.  
*Mastrutium*, Cass.  
*Perephora*, Hoffmans.  
*Klasea*, Cass.  
*Oligochaeta*, DC.  
*Jurinea*, Cass.

## Sub-order II. LABIATIFLORÆ.

## VI. MUTISIAEÆ.

## BARNADESIEÆ.

*Schlechtendalia*, Less.  
*Diacantha*, Less.  
*Barnadesia*, Linn. f.  
*Bacacia*, Ruiz et Pav.  
*Penthea*, Don.  
*Dasyphyllum*, H. B. K.  
*Fulcaldea*, Poir.  
*Turpinia*, H. B. K.  
*Voigtia*, Spr.  
*Dolichostylis*, Cass.  
*Flotovia*, Spreng.  
*Piptocarpha*, Hook.  
*Nardophyllum*, Hook.  
*Seris*, Less.  
*Lycoseris*, Cass.  
*Diazeuxis*, Don.  
*Langsdorfia*, Willd.  
*Chatachlena*, Don.  
*Chiquiragua*, Juss.  
*Johannia*, Willd.  
*Joannesia*, Pers.  
*Joannea*, Spr.  
*Moquinia*, DC.  
*Spadonia*, Less.  
*Gochnatia*, H. B. K.  
*Cyclolepis*, Don.  
*Cyclops*, Guillem.  
*Anastraphia*, Don.  
*Pentaphorus*, Don.  
*Hedraiohyllum*, Less.  
*Augusta*, Leandro.  
*Stiffia*, Mik.  
*Sankhilaria*, Leandro.  
*Mocina*, DC.  
*Mutisia*, L. fil.  
*Guariruma*, Cass.  
*Holophyllum*, Less.  
*Haplophyllum*, Less.  
*Proustia*, Lagasc.  
*Leucoryphe*, Endl.

*Thelecarpea*, DC.  
*Harmodia*, Don.  
*Calopappus*, Meyen.  
*Hyalis*, Don.  
*Brachyclados*, Don.  
*Chaetanthera*, Ruiz et P.  
*Bichenia*, Don.  
*Cherina*, Cass.  
*Enthria*, Don.  
*Proselia*, Don.  
*Pryonotophyllum*, Less.  
*Tylloma*, Don.  
*Pachylæna*, Don.  
*Trichocline*, Cass.  
*Amblyosperma*, Benth.  
*Onoseris*, DC.  
*Cladoseris*, Less.  
*Chaetachlena*, Don.  
*Isotypus*, H. B. K.  
*Seris*, Willd.  
*Hilaria*, DC.  
*Oldenburgia*, Less.  
*Seytala*, E. Mey.  
*Leucomeris*, Don.  
*Myrpinos*, Bunge.  
*Ainsliea*, DC.  
*Chionopectera*, DC.  
*Carmelita*, Cl. Gay.  
*Gerbera*, Gronov.  
*Aphyllacaulon*, Lag.  
*Leptica*, E. Mey.  
*Piloselloides*, Less.  
*Oreoseris*, DC.  
*Berniera*, DC.  
*Dicoma*, Cass.  
*Leucophyton*, Less.  
*Xeropappus*, Wall.  
*Microcoma*, DC.  
*Rhigiosthammus*, Less.  
*Macleidum*, Cass.  
*Nitidum*, Cass.  
*Pterocoma*, DC.  
*Printzia*, Cass.  
*? Lloydia*, Neck.

*Perdicium*, Lagasc.  
*Paradisum*, Burm.  
*Leiocarpum*, DC.  
*Anandria*, Siegesb.  
*Leibnitzia*, Cass.  
*Oriastrum*, Pöpp.

## LERIEÆ.

*Chaptalia*, Vent.  
*Cursonia*, Nutt.  
*Lieberkuhnia*, Cass.  
*Oxydon*, Less.  
*Loxodon*, Cass.  
*Chevreulia*, Cass.

## FACELIDEÆ.

*Lucilia*, Cass.  
*Oligandra*, Less.  
*Facelis*, Cass.

## VII. NASSAVIEÆ.

## POLYACHYRIDEÆ.

*Polyachyrus*, Lagasc.  
*Bridgesia*, Hook.  
*Diaphoranthus*, Mey.  
*Cephaloseris*, Pöpp.

## NASSAVIEÆ.

*Nassavin*, Commers.  
*Nassoria*, Pers.  
*Mastigophorus*, Cass.  
*Triachne*, Cass.  
*Triptilion*, Ruiz et Pav.  
*Acanthophyllum*, Hook.  
*et Arn.*  
*Panargyrum*, Lagasc.  
*Pindanthus*, Less.  
*Piptostenma*, Don.

*Caloptilium*, Lagasc.  
*Sphaerocephalus*, Lag.  
*Portalesia*, Meyen.

## TRIXIDEÆ.

*Pamphalea*, Lagasc.  
*Ceratolepis*, Cass.  
*Cephalopappus*, Nees et Mart.  
*Pleocarpus*, Don.  
*Pentanthus*, Hook et Arn.  
*Jungia*, L. fil.  
*Trinacta*, Gärtn.  
*Rhinactina*, Willd.  
*Martrasia*, Lagasc.  
*Moscharia*, Ruiz et Pav.  
*Moschifera*, Molina.  
*Mosigia*, Spreng.  
*Gastrocarpha*, Don.  
*Leuceria*, Lagasc.  
*Leucheria*, Less.  
*Macrobotrys*, DC.  
*Lasiorrhiza*, Lagasc.  
*Bertolonia*, DC.  
*Frageria*, DC.  
*Maclovio*, DC.  
*Cassiopa*, Don.  
*Chabrea*, DC.  
*Bowmannia*, Gardn.  
*Ptilurus*, Don.  
*Dumerilia*, Less.  
*Trixis*, P. Br.  
*Cleantes*, Don.  
*Platyichilus*, Cass.  
*Holochilus*, Cass.  
*Oligophyllum*, Less.  
*Polyphyllum*, Less.  
*Prionanthus*, Schrank.  
*Tenoria*, Berter.  
*Aleithoe*, Don.  
*Dolichlasium*, Lagasc.  
*Perezia*, Lagasc.  
*Chaetanthera*, H. B. K.



### Summary and Conclusions

1. *Journal of the American Medical Association*, 1997; 277: 1033-1037.

11706411 *Chen*

Hamm, Robert  
Hamm, Frank  
Hamm, George  
Hamm, John  
Hamm, William  
Hamm, William  
Hamm, William  
Hamm, William  
Hamm, William  
Hamm, William

Answer: 200

[illegible]

1. *Psychological* *Impact*  
 2. *Psychological* *Impact*  
 3. *Psychological* *Impact*



The Abyssinians employ the aromatic leaves of *Dichrocephala latifolia* as a spice. An oil is extracted in Abyssinia from the seeds of the *Carthamus tinctorius*, or Schuf. — *A. Richard*. The heads of a *Chrysanthemum* are collected in Dalmatia and dried as a guard against mosquitoes; when used a portion is ignited upon a live coal. — *Visiani*. *Crepis lacera* is called by De Candolle herba venenatissima (*Prodr.* VII. 161); to which Tenore adds: "Venenatissima planta lacte maxime acris scatens; eademque cum aliis sponte nascentibus Chicoreis ad juscula conficienda lecta, sæpe illa comedentes miserrime necavit." Similar qualities are ascribed to other Cichoraceæ, especially *Hieracium virosum* and *sabaudum*.

## ADDITIONAL GENERA.

## ETHULIÆ.

*Adenoon*, *Dalzell*.

## HETEROCOMEÆ.

*Bolanosa*, *A. Gray*.

## AGERATEÆ.

*Hofmeisteria*, *Wlprs.* = *Helogyne*.

## ADENOSTYLEÆ.

*Neilreichia*, *Fenzl*.  
*Trichogonia*, *Gardn*.  
*Clavigera*,  
*Bulbostylis*, } = *Brickellia*  
*Kanimia*, *Gardn*.

## ASTEREÆ.

*Homostylum*, *Nees*.  
*Warthemia*, *Boiss*.  
*Astradelphus*, *Rémy*.  
*Podocoma*, *R. Br*.

## HETEROPAPPÆ.

*Laphamia*, *A. Gr*.  
*Pericome*, *A. Gr*.

## BELLIDÆ.

*Platystephium*, *Gardn*.  
*Emphysopus*, *Hook. f.*  
*Ctenosperma*, *Hook. f.*

## SOLIDAGINÆ.

*Brachyactis*, *Led*.

## BACCHARIDÆ.

*Hymenopholis*, *Gardn*.

## TARCHONANTHÆ.

*Scyphocoronis*, *A. Gr*.  
*Anthocerastes*, *A. Gr*.

## PLUCHEINÆ.

*Gnaphalodes*, *A. Gr*.

## INULÆ.

*Inulaster*, *C. H. Sch*.  
*Pterochaete*, *Boiss*.  
*Grantia*, *Boiss*.  
*Leucactis*, *Edgew*.

## ECLIPTÆ.

*Linnogenneton*, *C. H. Sch*.

## SILPHIÆ.

*Guardiola* must be expunged  
*Lindheimera*, *A. Gr*.

## MELAMPODIÆ.

*Diotosperma*, *A. Gr*.  
*Tulocarpus*, = *Guardiola*, *H. B. K*.

## IVEÆ.

*Parthenice*, *A. Gr*.

## COREOPSIDEÆ.

*Wurmschmidtia*, *C. H. Sch*.  
*Stippia*, *C. H. Sch*.  
*Echinocephalum*, *Gardn*.  
*Serpæa*, *Gardn*.  
*Undea*, *Kth*.

## VERBESINÆ.

*Prestinaria*, *C. H. Sch*. = *Verbesina*.  
*Cosmidium*, *Torr. & Gr*. = *Thelesperma*.  
*Prionolepis*, *Pöpp*.

## FLAVERIÆ.

*Sartwellia*, *A. Gr*.

## TAGETEÆ.

*Comaclinium*, *Scheidw*.  
*Gnaphalopsis*, *DC*. = *Hymenatherum*.

## GAILLARDIÆ.

*Agassizia*, *A. Gr*.

## HELENIÆ.

*Pleurophyllum*, *Hook. f.* near *Argyroxiphium*.

## GALINSOGÆ.

*Amphicalca*, *Gardn*.

## ANTHEMIDÆ.

*Heliogenes*, *Benth*. = *Aganippea*.

## COTULÆ.

*Amblyopappus*, *H. & Arn*. } = *Aromia*.  
*Infantea*, *Rémy*.

## ARTEMISIÆ.

*Decaneurum*, *C. H. Sch*.  
*Xantho*, *Rémy*.

## HIPPIÆ.

*Scleroleima*, *Hook. f*.

## HELICHRYSÆ.

*Dimorpholepis*, *A. Gr*.  
*Melalema*, *Hook. f*.  
*Pteropogon*, *Du*.



*Acrostichum*, *L.* fr.  
*Belton*, *Russ.*  
*Comastichum*, *L.* fr.  
*Comastichum*, *L.* fr.  
*Acrostichum*, *L.* fr.  
*Belton*, *Russ.*  
*Comastichum*, *L.* fr.  
*Acrostichum*, *L.* fr.  
*Belton*, *Russ.*  
*Comastichum*, *L.* fr.  
*Acrostichum*, *L.* fr.

#### SECTIO III.

*Acrostichum*, *L.* fr.  
*Comastichum*, *L.* fr.  
*Belton*, *Russ.*

#### SECTIO IV.

*Belton*, *Russ.*

#### SECTIO V.

*Belton*, *Russ.*

#### SECTIO VI.

*Belton*, *Russ.*

#### SECTIO VII.

*Belton*, *Russ.*  
*Comastichum*, *L.* fr.  
*Belton*, *Russ.*

#### SECTIO VIII.

*Belton*, *Russ.*

#### SECTIO IX.

*Belton*, *Russ.*  
*Comastichum*, *L.* fr.

#### SECTIO X.

*Belton*, *Russ.*

#### SECTIO XI.

*Belton*, *Russ.*

#### SECTIO XII.

*Belton*, *Russ.*  
*Comastichum*, *L.* fr.  
*Belton*, *Russ.*



## ALLIANCE LI. MYRTALES.—THE MYRTAL ALLIANCE.

DIAGNOSIS.—*Epigynous Exogens, with polypetalous dichlamydeous flowers, axile placentæ, and embryo with little or no albumen.*

It may at first sight appear paradoxical to bring into close contact Orders usually so widely separated as Composites, Fringe-myrtles and Myrobalans; and it must be confessed that if the monopetalous corolla did deserve the value usually assigned to it, the measure would be incapable of justification. But if, as it is one of the objects of this book to show, we should neglect that circumstance, the relationship of all the plants now mentioned will be less problematical. It is the capitate inflorescence of Composites that gives them one of their most striking peculiarities; but that disappears in Valerianworts, about whose near relation to Composites no one entertains a doubt; and among the Myrobalans and Fringe-myrtles the tendency to a capitate condition is unusually great; as, for example, in Combretum and Conocarpus in the one, and in four-fifths of the species in the other. The relation of Myrobalans to Fringe-myrtles is not likely to be disputed; now the inflorescence of many genera differs in no respect from that of Composites, and on the other hand, numerous Composites agree entirely with Fringe-myrtles in their glandular leaves. Moreover, the calyx of the latter has often as great a claim to the designation of pappus as that of any Composites whatever. It must be confessed, however, that we have not at present among Composites any such tendency to a separation of the petals as would lead to the expectation of finding a polypetalous genus, which would render the assumed connection between Fringe-myrtles and Composites more evident.

But the example of Phyteuma among Bellworts leads to the anticipation of such a possibility; or if not, the tendency to unite the petals or stamens, which is so common in Myrtleblooms, may be expected to result in a monopetalous corolla among the Fringe-myrtles.

These remarks are not, however, introduced to show that Composites and Myrtles ought to stand in the same Alliance. That would certainly be an unnatural association. But they seem to show conclusively that they belong to Alliances standing extremely near each other.

## NATURAL ORDERS OF MYRTALS.

- |  |   |                      |
|--|---|----------------------|
| Ovary 1-celled. Ovules pendulous. Leaves dotless. Seeds without albumen. Cotyledons convolute . . . . .  | } | 274. COMBRETACEÆ.    |
| Ovary 1-celled. Ovules pendulous. Leaves dotless. Seeds albuminous. Cotyledons flat . . . . .  |   |                      |
| Ovary 1-celled. Ovules ascending. Leaves dotted. Embryo fused into a solid mass . . . . .  | } | 276. CHAMÆLAUCIACEÆ. |
| Ovary with more than one cell. Flowers polypetalous or apetalous. Calyx open, minute. Stamens definite. Ovules pendulous. Cotyledons minute. (Occasionally one-celled). . . . .            |   |                      |
| Ovary with more than one cell. Flowers polypetalous or apetalous. Calyx valvate. Stamens definite. Ovules horizontal or ascending. Cotyledons flat, much larger than the radicle . . . . . | } | 278. ONAGRACEÆ.      |
| Ovary with more than one cell. Flowers polypetalous. Calyx valvate. Stamens indefinite. Cotyledons flat, much shorter than the radicle, which germinates before the fruit falls . . . . .  |   |                      |
| Ovary with more than one cell. Flowers monopetalous coronetted. Calyx valvate. Stamens indefinite, monadelphous. Cotyledons amygdaloid . . . . .   | } | 280. BELVISIACEÆ.    |
| Ovary with more than one cell. Flowers polypetalous. Calyx imbricated. Stamens definite. Anthers rostrate. Leaves usually dotless . . . . .  |   |                      |
| Ovary with more than one cell. Flowers polypetalous or apetalous (or valvate). Calyx imbricated. Stamens 00. Anthers oblong. Leaves usually dotted . . . . .                               | } | 282. MYRTACEÆ.       |
| Ovary with more than one cell. Flowers polypetalous. Calyx valvate or imbricated. Stamens 00, in part collected into a fleshy hood. Anthers oblong. Leaves dotless . . . . .               |   |                      |

275. ALANGIACEÆ.

277. HALORAGACEÆ.

279. RHIZOPHORACEÆ.

281. MELASTOMACEÆ.

283. LECYTHIDACEÆ.







by their recurved anther-valves, in which they singularly correspond with Laurels. While, however, these seem to be the most immediate affinities of Myrobalans, we must not overlook their more distant kinship. To Myrtleblooms and Melastomads they are related through Memecylon, and especially to the former, by Punica, with which they agree in the structure of their embryo. In the latter respect they also accord with Mangroves and Vochyads; and with Alangiads and Onagrads in the general structure of the flower.

All natives of the tropics of Asia, Africa, and America. No species is extra-tropical.

Mostly astringents. *Bucida Buceras* yields a bark used for tanning. The bark of *Conocarpus racemosa*, one of the plants called Mangroves in Brazil, is used greatly at Rio Janeiro for the same purpose. The fruit of the *Terminalia belerica*, or the *Beleric Myrobalan*, is an astringent, tonic, and attenuant. The kernels are eaten in India, and reckoned intoxicating. The bark abounds in a gum, resembling Gum Arabic, soluble in water, burning away in the flame of a candle; a similar gum exudes from *Combretum alternifolium*. The bark of *Terminalia alata* is astringent and antifebrile. The fruit of *Terminalia Chebula*, as well as the galls of the same plant, are very astringent, and highly valued by dyers; with alum they give a durable yellow, and with a ferruginous mud an excellent black. The root of *T. latifolia* is given in Jamaica in diarrhœa. Species of *Terminalia*, *Conocarpus*, and *Pentaptera*, yield excellent timber. The kernels of *T. Catappa*, &c., are eaten as almonds, and are very palatable; those of *T. citrina* are a common article in Hindoo materia medica, being employed as a gentle purgative. A milky juice is described as flowing from *T. Benzoin*, which being fragrant on drying, and resembling Benzoin, is used in churches in the Mauritius as a kind of incense. Martius inform us that *Terminalia argentea*, called in Brazil *Caxapora do Gentio*, yields a resin of a drastic quality.

#### GENERA.

I. TERMINALEÆ.—Corolla usually 0. Cotyledons convolute.	<i>Calycopteris</i> , Lam. <i>Chuncoa</i> , Pav. <i>Gimbernatia</i> , R. et P. <i>Ramatuela</i> , H. B. K. <i>Conocarpus</i> , Gärtn. <i>Rudbeckia</i> , Adans. <i>Anogeissus</i> , Wall. <i>Andersonia</i> , Roxb. <i>Laguncularia</i> , Gärtn. <i>Sphenocarpus</i> , Rich. <i>Horan</i> , Adans. <i>Lumnitzera</i> , Willd. <i>Pyrranthus</i> , Jack. <i>Petaloma</i> , Roxb. <i>Bruguiera</i> , Thouars. <i>Funkia</i> , Dennst.	<i>Guiera</i> , Adans. <i>Poivreia</i> , Commers. <i>Cristaria</i> , Sonner. <i>Gonocarpus</i> , Hamilt.	<i>Quisqualis</i> , Rumph. <i>Spalanthus</i> , Jack. ? <i>Chrysostachys</i> , Pohl. ? <i>Agathisanthes</i> , Blum. ? <i>Ceratostachys</i> , Blum. ? <i>Bigamea</i> , Kön. <i>Wormia</i> , Vahl.
<i>Bucida</i> , Linn. <i>Buceras</i> , P. Br. <i>Hudsonia</i> , Robins. <i>Terminalia</i> , Linn. <i>Catappa</i> , Gärtn. <i>Tanibouca</i> , Aubl. <i>Adamaram</i> , Adans. <i>Myrobalanus</i> , Gärtn. <i>Badamia</i> , Gärtn. <i>Fatrea</i> , Thouars. <i>Pentaptera</i> , Roxb. <i>Getonia</i> , Roxb.		II. COMBRETÆÆ.—Corolla present. Cotyledons plaited.  <i>Combretum</i> , Löffl. <i>Actia</i> , Adans. <i>Forsgardia</i> , Fl. Fl. <i>Cacoucia</i> , Aubl. <i>Schousbea</i> , Willd. <i>Hambergera</i> , Scop. <i>Hambergia</i> , Neck.	III. GYROCARPÆÆ.—Corolla wanting. Cotyledons convolute. Anthers bursting by recurved valves.  <i>Gyrocarpus</i> , Jacq. <i>Illigera</i> , Bl.

NUMBERS. GEN. 22. Sp. 200.

*Myrtaceæ.*

POSITION.—Alangiaceæ.—COMBRETACEÆ.—Chamælauciaceæ.

*Lauraceæ.*



ORDER CCCLXXV ALANGIACEAE *W. AGNES-SMITH*.

*Alangium*. *Fl. Prodr.* 4: 200 (1825). *Alangium* (Sw.) Engelm. & Griseb. *Bot. Voy.* 1: 100 (1831). *Synonyma* (Sw.) Engelm. *Bot. Voy.* 1: 100 (1831). *Alangium* (Sw.) Engelm. & Griseb. *Bot. Voy.* 1: 100 (1831).

*Diagnosis*.—*Myrica* *Fl.* (Sw.) Engelm. with a 1-celled fruit, pendulous, rarely adnate, leaves alternate, entire, and glaucous.

Large trees or shrubs. Branches often spiny. Leaves alternately, terminal, oblong-entire, without dots. Flowers fasciated, axillary. Calyx adnate, 1-celled.



1 FIG. CCCLXXIX.

Petals 5-10, inserted near a fleshy adnate disk, linear, reflexed. Stamens long, exserted, 2-3 times as long as the petals or equal to them in some. Anthers 2-celled, villous at the base; anthers minute, linear, 2-celled, turned upwards, often empty. Ovary 1-2-celled, style filiform, simple; ovules solitary, pendulous, anatropal. Embryos, somewhat curved by the calyx, fleshy, dilated at the base, and showing a nucleus (1-celled, large, with a hilum at the apex). Seed 1, inverted; albumen fleshy, small; embryo straight, rather long, superior, pendulous, flat, large, hairy.



According to the Chinese, who named this seed *Chia*, it differs from *Myrica* in its numerous pendulous anthers, 1-celled fruit, and pendulous albumen seeds. *Diagram* of *Myrica* (1-celled fruit) relative to the seed.

tube of the calyx, 1-celled fruit, and pendulous seeds; but differs in the number of the petals, adnate anthers, albumen seeds, and flat pericarp. The *Alangium* is entirely with *Melastomaceae* and *Onagraceae*, in the form of the anthers, and 1-celled fruit. It in some measure approaches *Hippuridaceae* in the form of the seed, but recedes from them in habit, 1-celled fruit, and single axis. Its most interesting relationship, next to *Myrica*, is with *Cornus*, in which *Alangium* approaches, and with *Witch Hazels*, whose long narrow pendulous seeds are very similar to those of *Alangium*.

But notwithstanding the near relation between these groups the comparatively enormous and small quantity of albumen seem to indicate a great distance between *Myrica* and *Alangium* than between the latter and the *Umbelliferae* and the *Cruciferae* may be best regarded as the representative of the central alliance in the *Cruciferae* Alliance. I think there can be little doubt that *Nyssa* is a member of the *Cruciferae* Alliance. *Ad. Brongniart* has partly suggested (*Ann. Sci. Nat.* 1841, 1842) the want of petals. Mr. Bennett states that the genus *Nyssa* is 1-celled, not *Cornus*, but that does not correspond with the description made for *Nyssa* fruit.

FIG. CCCLXXIX. *Alangium* (Sw.) Engelm. & Griseb. *Bot. Voy.* 1: 100 (1831).  
FIG. CCCLXXX. *Nyssa* (Sw.) Engelm. & Griseb. *Bot. Voy.* 1: 100 (1831).



Common in the southern parts of India, whence they extend along the Malayan Peninsula to Cochin China, northward along the forest-clad base of the Himalaya. The Nyssas are natives of the United States.

Alangium decapetalum and hexapetalum are said by the Malays to have a purgative hydragogic property. Their roots are aromatic. They are said to afford good wood and edible fruit.—*Royle*. Dr. Wight says that the fruit of the Alangiums is eatable, but not palatable, being mucilaginous and insipid. That of *Nyssa capitata* or *candicans* is subacid, the size of the Olive, and sometimes called the Ogechee Lime, because it is used occasionally as a substitute for Lime fruits. The timber of the Nyssas, called Tupelo trees, is difficult to split, in consequence of the fibres of its wood being much interwoven, but it is of little value.

#### GENERA.

Alangium, Lam.	Marlea, Roxb.	Pantsavia, Juss.	Nyssa, Gronov.
Angolan, Adans.	Stylidium, Lour.	Diacæcarpium, Bl.	Tupelo, Adans.
Angolamia, Scop.	Stylis, Poir.		Mastixia, Bl.

NUMBERS. GEN. 3. Sp. 8.

*Cornaceæ.*

POSITION.—Combretaceæ.—ALANGIACEÆ.—Chamælauciaceæ.

*Myrtaceæ.*

See Blume, *Mus. Lugd. Bat.*, 286, &c., and Hooker, *Journ. N. S.*, II. 129.

Blume thinks *Polyosma* (a supposed Escalloniad) more nearly related to this Order, but as it differs from both it and Cornels, he proposes it as the type of an Order, *Polyosmaceæ* (*Mus. Lugd. p.* 258).



ORDER CCLXXVI CHAMBLAUCIAE E—F. *Fuchs*, 1896. 10 pp., 1 pl.[illegible]

DIAGNOSIS.—*Myrtal longipennis*, with a lolling wing, ascending stroke, closed bases, and the embryos found with a solid mass.

Small bushes, often resembling Heaths, with all their parts abounding in glandular  
 cysts. Leaves evergreen, aciculate, or flat. Flowers  $\frac{1}{2}$ , in terminal racemes.



Fig. 6661 XXXI.

style simple; stigma simple; ovules anatropal, 2 or more, attached to the axile placenta laterally, and either ascending or attached to the side of the ovary. Fruit a locular, hiscent pericarp. [Seed without albumen; embryo orthotropal, homogeneous, without distinction of cotyledons, radicle, and plumule. — *S. latifolia*.]

Up to the present time these have been regarded as a section of the Umbelliferae or Myrridaceae; and there can be no doubt of their close relation. They appear to merit a distinction from them on account of their very peculiar pappus, which consists of many long hairs. Myrridblooms except some Bæckias, their remarkably slender ovary, which never indicates a trace of being formed by the adhesion of more than one, and their papose calyx. The latter character I believe must confine them to Composites, notwithstanding their disunited joints and anthers. The relation has been found between Myrsinaceae and Myrridaceae were supposed to exist in plants.

They are beautiful little bushes, abounding in many parts of New England, and in only a very few instances reaching the northern coast.

They participate in the fragrance of the *allurements* of *Myrtus* and *Myrtus* recorded of their uses.

CHINA

<i>Calytrix</i> , Labill.	<i>Verticordia</i> , DC.	<i>Homocidus</i> (Hym.), Latr.	<i>Homocidus</i> (Hym.), Latr.
<i>Calypsothrix</i> , Labill.	<i>C. verticordata</i> , (L.) S. & A.	<i>H. angustatus</i> , Latr.	<i>Homocidus</i> (Hym.), Latr.
<i>Lhotskya</i> , Schreb.	<i>Verticordia</i> , B. & H.	<i>H. angustatus</i> , Latr.	<i>Homocidus</i> (Hym.), Latr.
<i>Thryptomene</i> , Forst.	<i>Chrysopsis</i> , DC.	<i>H. angustatus</i> , Latr.	<i>Homocidus</i> (Hym.), Latr.
<i>Pileanthus</i> , Labill.	<i>Chamaecaryus</i> , Forst.	<i>H. angustatus</i> , Latr.	<i>Homocidus</i> (Hym.), Latr.

NUMERICAL ANALYSIS 15

11

Position - Assistant Collector of Customs and Excise.

Fig. CCCCLXXI—1. Colony; 2. A cluster of hyphae; 3. A hypha; 4. A zoospore.



## ORDER CCLXXVII. HALORAGACEÆ.—HIPPURIDS.

Haloragææ, *R. Brown in Flinders*, 17. (1814); *DC. Prodr.* 3. 65; *Bartl. Ord. Nat.* 314.; *Endl. Gen. celxvi.*; *Wight Illustr.* 2. 23.—Hygrobieæ, *Rich. Anal. Fr.* (1808).—Hippurideæ, *Link. Enum.* 1. 5. (1821).—Cercodianeæ, *Juss. Dict. Sc. Nat.* (1817).—Hydrocaryes, *Link Enum. Hort. Ber.* 1. 141 (1821).—Onagrariæ, § Hydrocaryes, *DC. Prodr.* 3. 63. (1828).

DIAGNOSIS.—*Myrtal Exogens*, with a plurilocular ovary, polypetalous or apetalous flowers, an open minute calyc, definite stamens, pendulous ovules, and minute cotyledons.

Herbaceous plants or under-shrubs, often growing in wet places. Leaves either alternate, opposite, or whorled. Flowers axillary, small, either in terminal panicles or sessile, occasionally

monœcious or dioecious by abortion. Calyx adherent, with a minute limb, which is 2-4-toothed, or perfectly undivided. Petals inserted into the summit of the calyx, or 0. Stamens inserted in the same place, equal in number to the petals, or occasionally fewer. Ovary adhering inseparably to the calyx, with 1 or more cells; style none; stigmas equal in number to the cells, papulose, or pencil-formed; ovules pendulous, anatropal. Fruit dry, indehiscent, membranous, or bony, with 1 or more cells. Seeds solitary, pendulous; albumen fleshy or 0; embryo straight; radicle superior, large; cotyledons much smaller.

These plants may be regarded either as a distinct Order, or as a mere degeneration or imperfect form of Onagrads, from which their minute calyx and solitary pendulous seeds distinguish them; to



Fig. CCCCLXXXII.

which may be added an evident tendency on the part of Hippurids to lose their petals altogether. In Hippuris itself the flower is in the simplest possible form; for it is reduced to a calyx of the smallest size, it has no petals, but one stamen and but one carpel. It therefore furnishes an instance of the approach of Myrtals to the Asteral Alliance. This reduction of the fruit to one carpel only, seems however to be very different in Hippuris from that of Fringe-myrtles; for the latter have a multiplication and excessive development of every other organ, to which the pistil forms the exception; but in Hippuris



the solitary carpel is only a portion of the depressed ovary; either 2- or 3-lobed, with the other ovules. In *Hippuris* and *Myriophyllum* the ovary consists of a superior half,

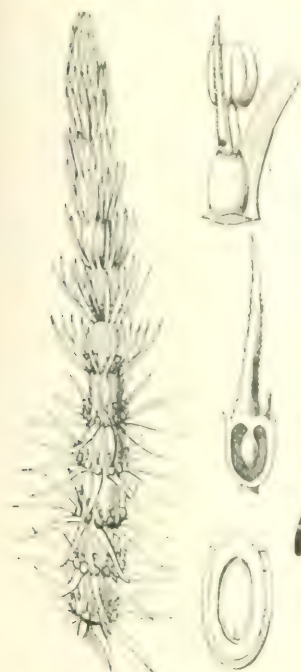


FIG. CCCCLXXXIII.

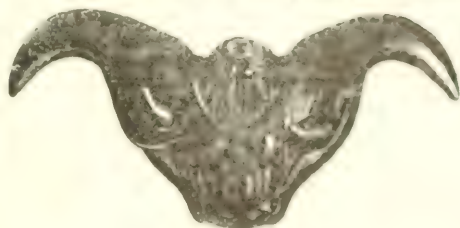


FIG. CCCCLXXXIII.

the Chinese. It is mentioned by Dr. Royle that the Empire yielded in 1860, 22,000,000 taels, a year of revenue to the government of Kiangsi Single the total amount yielded to the crown 96,000 to 126,000 assloads from the great lake of Goolah.

## GENERA.

I. HALORAGACEÆ.		
<i>Hippuris</i> , Leon.	<i>Peristrophe</i> , Trin.	<i>Trigonotis</i> , Lam.
<i>Limnospiza</i> , Vahl.	<i>Schmidneria</i> , Yeu.	<i>Trigonotis</i> , Lam.
<i>Pterostichia</i> , Dillen.	<i>Pterostichia</i> , Nott.	<i>Trigonotis</i> , Lam.
<i>Myriophyllum</i> , Pers.	<i>Pterostichia</i> , Raf.	<i>Trigonotis</i> , Lam.
<i>Sphondyliophyllum</i>	<i>Holcus</i> , Benth.	<i>Trigonotis</i> , Lam.
Torrey et Gray.	<i>Serpentaria</i> , Linn.	<i>Trigonotis</i> , Lam.
	<i>Camptocarpus</i> , Benth.	<i>Trigonotis</i> , Lam.

NUMBERS. GEN. 1. SP. 10.

POSITION.

POSITION. — Onagraceæ, — Haloragaceæ.

FIG. CCCCLXXXIII.—*Hippuris vulgaris*. 1. a single flower; 2. a section of the fruit showing the position of the ovule; 3. a section of the fruit showing the position of the ovule.

FIG. CCCCLXXXIV.—Fruit of *Trigonotis*.

## ADDITION TO OCCURENCE.

*Erithalis*, B. & S. *Serpentaria*,  
*Pterostichia*, Benth. et

*Trigonotis*, Lam.  
*Trigonotis*, Lam. et B.



## ORDER CCLXXVIII. ONAGRACEÆ.—ONAGRADS.

*Onagrea*, Juss. Gen. 317. (1789); *Spach*, in *Ann. Sc. N.* 2 Ser. iv. 161.—*Epilobiaceæ*, Vent. Tabl. 3. 307. (1799).—*Onagrarie*, Juss. Ann. Mus. 3. 315. (1804) in part.; *DC. Prodr.* 3. 35. (1828); *Bartl. Ord. Nat.* 318; *Wight Illustr.* 2. 21.—*Enotheræ*, Endl. Gen. cclxv.—*Circæææ*, Lindl. *Synops.* p. 109. (1829).

**DIAGNOSIS.**—*Myrtal Exogens*, with a plurilocular ovary, polypetalous or apetalous flowers, valvate calyx, definite stamens, horizontal or ascending ovules, and flat cotyledons, much larger than the radicle.

Herbaceous plants or shrubs. Leaves alternate or opposite, simple, entire, or toothed. Flowers red, purple, white, blue, or yellow, axillary or terminal. Calyx superior,



Fig. CCCCLXXXV.

tubular, with the limb 4-lobed; the lobes cohering in various degrees, with a valvate aestivation. Petals generally equal in number to the lobes of the calyx, into the throat of which they are inserted, regular, with a twisted aestivation. Stamens (1) 4 or 3, inserted into the calyx; filaments distinct; pollen triangular, usually cohering by threads. Ovary of 2 or 4 cells, generally crowned by a disk; style filiform; stigma either capitate or 4-lobed; ovules anatropal, horizontal, ascending, or peltate. Fruit baccate or capsular, many-seeded, with 2-4 cells. Seeds numerous, without albumen; embryo straight; radicle long and taper; cotyledons shorter.

The Onagradæ, thus limited, are in general tetramerous, the number 4 prevailing through every one of the floral organs. In *Circæææ*, however, the number is halved, there being but two sepals, petals, &c., and in *Lopezia* the customary number seems to be still further interfered with, for that genus shows but one stamen; in reality, however, there are two stamens, one of them perfect and bearing an anther; the other sterile and in the form of a spoon-shaped petal. Although the petals are in general of large size and in a high state of development, yet there is a tendency among the species to lose them; I have seen an entire plant of *Clarkia pulchella* with every flower apetalous, and *Skinneria* is always so. From *Myrtleblooms* Onagradæ are known by the absence of pellucid dots and their definite stamens; the Orders approach each other by the genus *Fuchsia*, which has succulent fruit.

They are chiefly natives of the temperate parts of the world, and especially of America: a good many are found in India, and a large number in Europe; in Africa they are scarcer, being mostly confined to the Cape, and to a few *Jussieææ* inhabiting other parts of that continent.

Their properties are few, or trifling. *Enothera biennis*, and some other species less commonly known, are cultivated for the sake of their eatable roots; and the leaves of

Fig. CCCCLXXXV.—*Ludwigia Jussæoides*. 1. a flower with two sepals and all the petals cut off; 2. a calyx and inferior ovary; 3. a transverse section of the ovary; 4. a seed with the distinct raphe; 5. an embryo extracted.







## ORDER CCLXXIX. RHIZOPHORACEÆ.—MANGROVES.

Rhizophoreæ, *R. Brown Gen. Rem. in Flinders*, p. 17. (1814); *in Congo*, p. 18. (1818); *DC. Prodr.* 3. 31. (1828); *Bartl. Ord. Nat.* 320. (1830); *Endl. Gen. cclxiii.*; *Meisn. p.* 119; *Wight. Illustr.* 1. 207; *Arnott in Ann. Nat. Hist.* 1. 359.—*Paletuviers, Savigny in Lam. Dict.* 4. 696. (1796).

**DIAGNOSIS.**—*Myrtal Exogens*, with a plurilocular ovary, polypetalous flowers, valvate calyx, indefinite stamens, and flat cotyledons much shorter than the radicle, which germinates before the fruit falls.

Coast trees or shrubs. Leaves simple, opposite, occasionally dotted, entire or toothed, with convolute deciduous stipules between the petioles. Peduncles axillary or terminal. Calyx adherent, often surrounded at the base by a cup-shaped bract, with the lobes valvate and varying in number from 4 to 12, occasionally all cohering in a calyptra. Petals arising from the calyx, alternate with the lobes, and equal to them in number. Stamens arising from the same point as the petals, and twice or thrice their number, or in *Kandelia* indefinite; filaments distinct; anthers erect, innate. Ovary 2-3-4-celled, each cell containing 2 or more ovules hanging from the apex of the central angle, anatropal. Fruit indehiscent, crowned by the calyx, 1-celled, 1-seeded. Seed pendulous, without albumen; radicle very long, piercing the fruit and rapidly extending downwards in germination; cotyledons 2, flat.

Mangroves are readily known from every Order to which they can be usefully compared, by their very curious habit of germinating while the seeds are still attached to the branch that bears the fruit. The radicle and club-shaped crown of the root gradually lengthen until they enter the soft muddy soil, or if too high, drop, and fixing themselves in the muddy bottom, immediately strike root at one end, while leaves unfold at the other.—*Wight.* In *Carallia*, however, the seeds do not germinate in the pericarp. That the species belong to the Myrtal Alliance there can be no doubt; as indeed is indicated, not only by their structure but by the leaves of some species of *Carallia* having pellucid dots. At the same time they seem to be connected with the Gentianial Alliance through *Cassipourea*, which comes very close to *Loganiads*. The Order also agrees with *Cunoniads* in its opposite leaves and intermediate stipules, and with great part of them in the æstivation of its calyx, and in the structure and cohesion of ovary. De Candolle points out its relation to *Vochyads* and *Myrobalans*, and even to *Melastomads*, through the genus *Olisbea*. The genera were comprehended in *Loranthis* by *Jussieu*. Mr. Griffith has explained with his usual skill the nature of the anther in *Rhizophora*. In the plants belonging to that genus the anther is alveolar, the sockets being filled with pollen, and in this circumstance it resembles *Viscum*; but in its younger state the anther is oblong, compressed laterally, and uninterrupted on its surface; when it is mature its two faces fall away, and leave behind a solid centre, in cavities of which the pollen has been generated. See *Transactions of Med. and Phys. Soc., Calcutta.*

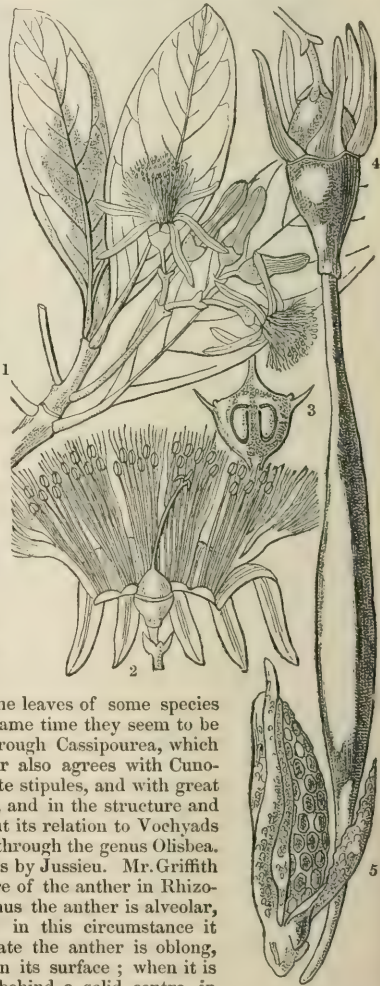


Fig. CCCCLXXXVI.

Fig. CCCCLXXXVI.—1. *Kandelia Rheedii* (*Wight*); 2. its flower spread open; 3. a perpendicular section of its ovary; 4. the germinating seed; 5. the anther of *Rhizophora macrorhiza*. (*Griffith*.)



Natives of the shores of the tropics, where they find in the bark, and long a stem thrust down to the centre of the ocean. Such growths are so dense that they actually intercept the rays of the sun, and, preventing the evaporation of water, become the most salubrious places in a tropical climate. The species growing well down roots from the branches, and rise like the Bayonet tree, possibly several very considerable spaces. Such trees continue to extend tops with the main stem, and gradually raise the main trunk, in filling leaves, both above, in original form.

The bark is usually astringent; that of *Rhizophora gymnocarpa* is said to taste indyng blue. The wood of several is described as being black and durable. The fruit of *Rhizophora Mangle* is said to be sweet and edible, and the juice when fermented forms a light wine—W. J. L.

## GENERA.

<i>Rhizophora</i> , Lam.	<i>Excoecaria</i> , Jacq.	<i>Conocarpus</i> , Thunberg.	<i>Preussia</i> , Hb.
<i>Myrica</i> , Pers.	<i>Pholidota</i> , Thunberg.	<i>Conocarpus</i> , Thunberg.	<i>Conocarpus</i> , Thunberg.
<i>Corchorus</i> , Jacq.	<i>Cassia</i> , B. & H.	<i>Conocarpus</i> , Thunberg.	<i>Conocarpus</i> , Thunberg.
<i>Rhizophora</i> , W. J. L.			

## NUMBERS, GEN. &amp; Sp. 18.

POSITION.—*Meisneria*, *Rhizophora*, *Myrica*,  
*Conocarpus*.

In the economy of nature the Mangrove performs a most important part, securing annually fresh portions of the land from the dominion of the ocean, and adding them to the domain of man: it is effected in a twofold manner, by the progressive advance of the roots, and by the actual germination of the seeds, which do not quit their lofty cradle till they have assumed the form of aerial trees, and draw up the water with their roots ready prepared to take possession of the soil in advance of their parent stems. The progression by means of the roots is effected by fresh roots which issue from the trunk at some distance above the surface of the water, and arching downwards, penetrate the soil, establishing themselves in the fissures of fresh invasions of the retreating element. In this manner, the plants move on steadily forward till they have attained a height of about 25 feet, and moved a portion considerably in advance of their parent trunks. After that point additional is made to the roots, but the head begins to expand in every direction, spreading its branches on all sides. These branches, in their turn, send down rootlets, and rootlets, like those of the Bayonet tree (*Thespesia*), which rapidly elongate, and branch, all varieties of height, and reaching the water, penetrate the soil, becoming in time independent trees: thus a continued labyrinth is at length formed. Almost every part of the Mangrove—the bark, roots, and the fruit were particularly strongly an astringent principle, which is successfully applied in the treatment of wounds. The external application, in arresting hemorrhages and disordered secretions, always assumes a healthy action, a derivation of the blood has been found most effectual by Dr. Barham, who informs us in his work that he had a man "that was extremely full of the continent small pox, the soles of whose feet swelled and burst off like the sole of a shoe, and left his feet raw, and so tender that he could not set any thing upon the ground, upon which he sent for some of the bark of *Rhizophora*, and boiled it in water strong, with which he bathed his feet every day, and in about a week & a half his feet were as hard and firm as ever, and he was able to walk about without any pain." For tanning, the Mangrove is said to be infinitely superior to Oak bark, requiring in six weeks an operation which with the latter requires at least six months, and the sole leather so tanned is said to be more durable than any made.—Dr. Wm. Hamilton in *Pharmaceutical Journal*.

## ADDITIONAL GENUS.

*Antiphyllaea*, R. Br. may belong to one of the *Conocarpus*, or to a new species of *Conocarpus*. See *Niger Plant*.

According to Blume (*Mus. Lapid. Bat.* 12) this *Conocarpus* is very near *Conocarpus* p. 604.



## ORDER CCLXXX. BELVISIACEÆ.—NAPOLÉONWORTS.

Belvisier, *R. Brown in Lim. Trans.* 13. 222. (1820); *Ed. Pr. No.* cxxxii.; *Meisner Gen. Napoleonææ*, *Endl. Gen.* p. 745. (1839).

DIAGNOSIS.—*Myrtal Exogens*, with a plurilocular ovary, monopetalous coronetted flowers, valvate calyx, indefinite monadelphous stamens, and amygdaloid cotyledons.

Smooth-leaved bushes, about as large as a Camellia. The wood is soft, whitish, with large medullary rays, and an abundance of dotted vessels, intermingled with brittle acicular tubes of woody tissue, very like what is found in the germinating radicle of a Mangrove. The leaves are alternate, leathery, narrowed at the base into a thick channelled petiole; there is no trace of stipules. The flowers grow in threes, sessile in the axil of the leaves, and are surrounded at their base by several round imbricated scales. The calyx is a thick leathery cup, divided into five ovate segments, having a perfectly valvate aestivation. Within this is placed the corolla, which consists of 3 distinct rings, each of which is monopetalous. The first ring is divided into five lobes, each of which has seven stiff ribs, between which the texture is membranous; the lobes have seven broad teeth, corresponding with the points of the ribs, and much curled and crumpled. By means of the ribs and intervening membrane, this part of the corolla is strongly plaited both before and after expansion; when fully blown, it turns quite back over the calyx, so as to hide it completely. The second ring is very small and thin; it is, in fact, a narrow membrane, stationed at the foot of the first ring, and cut into an indefinite number of fine narrow sharp-pointed segments. This ring was overlooked by De Beauvois. The third ring is membranous, but erect, and assuming the form of a cup, whose edge is cut into

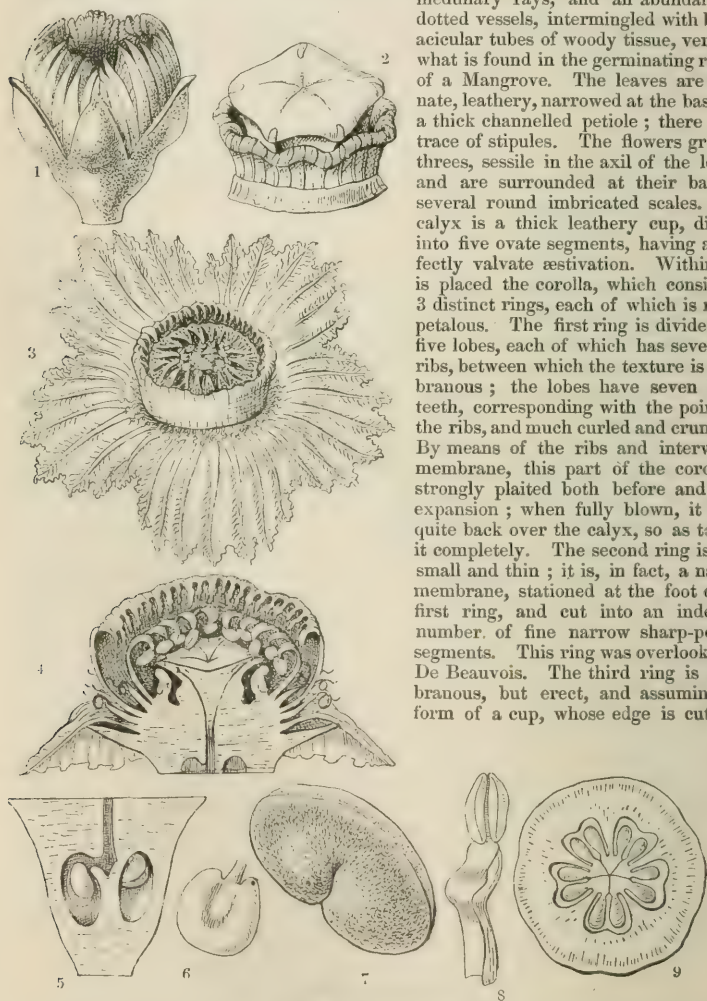


Fig. CCCCLXXXVII.

Fig. CCCCLXXXVII.—*Napoleonæa imperialis*. 1. a flower-bud just expanding; 2. the fleshy cup, and table shaped stigma; 3. an expanded flower of the natural size; 4. a perpendicular section of the same. (In this the artist has carelessly added a fourth ring to the corolla on the outside of the stamens; no such ring exists); 5. a perpendicular section of the ovary; 6. an ovule; 7. a ripe seed; 8. a stamen; 9. a transverse section of the ovary.



many fine segments, turned downwards, so as to form all contiguous. The petals are 20, standing erect in the form of another ring, well imbricated so that they have four-fifths of themselves, when put back, behind the others, so that there remain inward : the anthers (with beards, twisted, and long). The ovary presents a deep fleshy cone or disk, standing as high as the stigma, and having between it and the nectary an alternate with the lobes of the stigma, and 2 lobes on its inside. The ovary is broad beneath, the base formed by the base of the stigma, the nectary, and disk : it has five cells, in each of which two ovules hang from the top to an axile placenta, which is situated in the partition that divides the cells from each other : the hollow centre of the style, over the ovules, runs the middle of the ovary. The ovules are oblong, with a depression in the middle on each side, and a narrow point at the base, the nucleus being curved like a horseshoe, so that its base and every one being in contact : the style is longish, or rather extremely short, terminated by a small stigma, with five sides, five rays, and a small (regular but most easily detached) stigma, which is perhaps the true stigmatic surface. The fruit is a subglobose berry, surrounded by the calyx, as large as a *Passiflora*, and very lax, very succulent, & containing a watery pulp which is eatable, and a hard sooty ball of seeds, that the berries really contain. The seeds are large, angular or bell-shaped, shiny, smooth, and somewhat flattened, so their contraction the plano-convex cotyledons held together by an elastic tissue, and plumule are both immersed in the substance of the cotyledons.

In the total absence of all correct information as to the real nature of this curious genus, Botanists were unable to arrive at any satisfactory conclusion as to its affinities. All that they had been able to settle was its not relating to the *Passifloraceae*, as Palsot De Beauvais stated (1797) that, in the system of Jussieu, it belonged to the Order between *Cucurbitae* and *Passifloraceae*, so that that was probably adopted as consequence of the double-ribbed corolla, which is analogous to the segments of the *Passiflorae*, and the plaited corolla with an imbricate ovary, which brings it near the flowers of *Cucurbitae*. Desfontaines, in the century (1805) next to it, and another genus which he calls *Asteranthus*, without any doubt, as *Symphoricarpos* belongs to the monopetalous perigynous corolla, its stamens inserted in the base of the corolla, its oblong two-celled anthers, single style, inferior ovary, axillary solitary flowers, a woody stem, and alternate leaves. Him followed Dr. Robert Brown (1815) who brought *Asteranthus* and *Symphoricarpos* into an Order called *Elysiacae*, without, however attempting to settle its position in the Natural System. He appeared to be disappointed in its affinities, doubted its affinity to *Passiflorae*, and compared its structure with that of *Linnaea*. Latterly no one seems to have attempted to suggest anything new as to its affinities. Endlicher puts it next to *Symphoricarpos* : Humboldt & Bonpland, seeing it was not had been previously known of it, that its seeds are angular, & compare it to the genus originated in De Beauvais's description of them, as *Symphoricarpos*. Finally, I myself, feeling that these could not be its true affinities, placed it in the sub-tribe *Alliance*, with marks of great doubt. But I was thinking of the possible cause, in the kindness of the Earl of Devon, to examine good specimens, collected by Mr. Wilson, from which the foregoing description and interesting presentations were for the *Technical Review*.

It is obvious that *Napellaea* has nothing to do with any of the genera already referred. From *Cucurbitae* it differs utterly in its flowers, leaves, ovary, and placenta, highly developed corolla, and whole habit, so that its resemblance to that Order. *Passiflorae* seem at first sight to offer a much more satisfactory, because of the triple-ribbed corolla of *Napellaea*, which grows round the ovary, & those plants ; but then the rest of the ovary. The ovary, perianth, petals, & ovary, distinct styles, polypetalous corolla, imbricated ovary of *Passiflorae* are all most essentially at variance with the genus. *Symphoricarpos* has a monopetalous corolla, indefinite epipetalous stamens, a long slender style, and definite seeds of *Napellaea* that have a parallel, but the ovary of that genus is wholly adherent, with a great epigynous disk, the ovules are numerous, and the seeds have no albumen, to say nothing of the lateral position of the ovules, which is not in the wholly disregarded in a consideration of this kind. Upon my species agreeing that true affinity is in the neighbourhood of the *Alseodendreae*, *Hamamelidaceae*, on the following reasons :—The ovary is in both inferior, four-celled, double-ribbed, & the styles have a coriaceous valvate calyx : both have been noticed by both authors. The placenta of *Kandeha* is almost the same as that of *Symphoricarpos* with the lobes, the genus the petals are broken up into numerous fragments, and the petals of the genus in question. To this may be added the great resemblance that exist between the wood of *Napellaea* and of young *Hamamelis*, in consisting of both ascending & descending of slender acicular tubes, which give the wood, when broken, a very agreeable, containing slender bristles. Finally, the ribbed, which is very conspicuous in the more



corolla of *Napoleona*, is repeated in the calyx of *Bruguiera gymnorhiza*. It is true that the one genus is monopetalous and the other polypetalous, but I cannot attribute importance to that character in a case where the stamens adhere so slightly to the corolla. While, however, there is this reason to believe that Mangroves are most nearly related to Napoleonworts, the affinity of the Order to some Myrtal plants is not to be overlooked; as, for example, to *Careya*, whose fruit has a very similar structure, and to *Barringtonia*, to which *Napoleona* is even similar in foliage; but these affinities are less striking than that of the Mangrove tribe. They show, however, pretty clearly that Belvisiaceæ—for so it is most convenient to call the Order of which *Napoleona* is the most conspicuous member—belongs to the great Myrtal Alliance. At the very moment when these remarks were published in England, M. Adrien de Jussieu described another species of *Napoleona* (in the *Annales des Sciences*, vol. ii. p. 222, third series), and adopted the views which Desfontaines had taken as to its affinities. I do not, however, see any cause to alter the opinion I had myself formed on the subject.

The Order is wholly African and tropical. It is in the wilds of that little-examined part of the world that additions must be expected to it. The statement made by Desfontaines that the genus *Asteranthus* is Brazilian, has been doubted by Endlicher and negatived by Adrien de Jussieu.

Nothing is known of the uses of the plants, except what is above mentioned.

#### GENERA.

*Asteranthos*, Desf.

*Napoleona*, Palis.

*Belvisia*, Desv.

NUMBERS. GEN. 2. Sp. 4.

*Styracaceæ.*

POSITION.—Myrtaceæ.—BELVISIACEÆ.—Rhizophoraceæ.

*Passifloraceæ.*

Mr. Bentham, in the *Niger Flora*, p. 360, considers this a mere section of Myrtaceæ.







rious ways beyond the insertion of the filament; sometimes bursting longitudinally; before flowering, contained within the cases between the ovary and sides of the calyx. Ovary more or less coherent with the calyx, with several cells, and definite or indefinite ovules; style 1; stigma simple, either capitate or minute; a cup often present upon the apex of the ovary, surrounding the style. Pericarp either dry and distinct from the calyx, or succulent and combined with the calyx, with several cells; if dehiscent, bursting through the valves, which therefore bear the septa in the middle; placentæ attached to a central column. Seeds innumerable, minute, with a brittle testa and no albumen; usually with appendages of some kind; embryo straight, or curved, with equal or unequal flat or convolute cotyledons.

"The Order of Melastomads," remarks De Candolle, in an excellent Memoir upon the subject, "although composed entirely of exotic plants, and established at a period when but few species were known, is so well characterised, that no one has ever thought of putting any part of it in any other group, or even introducing into it genera that do not rightly belong to it." These distinct characters are, the opposite leaves, with several great veins or ribs running from the base to the apex, and the long beaked anthers. Good, however, in most cases, as these characters undoubtedly are, yet the cause of no uncertainty having been yet found in fixing the limits of the Order, is rather to be attributed to the small

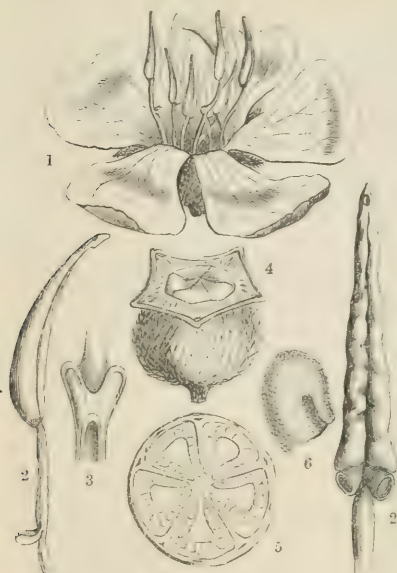


Fig. CCCCLXXXIX.

number of species that have been examined, than to the want of connecting links: thus *Diplogenea* has traces of the dots of *Myrtles*, which were not known to exist in *Melastomads* until that genus was described. *Mouriria* has no ribs, and its leaves are very distinctly dotted; the *Memecylons* are ribless, and so is *Sonerila*.

The greatest affinity of *Melastomads* is on the one hand with *Lythrales*, on the other with *Myrtleblooms* and their allies; for the former they differ in the aestivation of their calyx not being valvate, from the latter in having the petals twisted before expansion, and no dots on the leaves, and from both, and all others to which they can be compared, in their long anthers bent down parallel to the filaments in the flower, and lying in niches between the calyx and ovary; with the exception of *Memecyls*, in which the union between the calyx and ovary is complete, and which have leaves destitute of the lateral ribs that so strongly point out *Melastomads*. The structure of the seeds of *Memecyls* is also peculiar, the cotyledons being convolute as in *Myrobalans*, to which the *Myrtleblooms* approach at this point. It was for these reasons that the *Memecyls* were regarded as the type of a peculiar Order, but it seems on the whole more advisable to retain them as a section of *Melastomads*. That the convolute cotyledons are of no moment is proved by the genus *Chamameles*, which differs from other *Apple-works* in the same manner. Mr. Gardner makes *Mouriria* the type of an Order, because its leaves are dotted and ribless, its ovary perfectly adherent, and its ovules solitary. Sir W. Hooker, however, finds 3 erect ovules in each cell. It is doubtless a genus connecting the *Myrtleblooms* and *Melastomads*, and belonging almost as much to one as to the other Order, as Brown long ago stated. As to the *Olinieæ*, Mr. Arnott regards them as being nearer *Myrtleblooms* than *Melastomads*; but they can hardly be separated from *Memecyls*.

Found neither in Europe nor in Africa north of the desert of Zahara, nor south of Brazil in South America, nor in extra-tropical Africa to the south. Beyond the tropics, 8 are found in the United States, a few in China and the northern provinces of India, and 3 in New Holland. Of the remainder, it appears that 78 are described from India

Fig. CCCCLXXXIX.—*Melastoma polyanthum*. 1. flower; 2, 2. stamens; 3. base of anther; 4. fruit; 5. section of ditto; 6. seed—after Blume.



of the Indian Aryas, 1<sup>st</sup> India, Africa and the adjacent islands, and 2<sup>nd</sup> South America, according to the Causality but the correspondence does not exist.

A slight degree of bitterness is the prevailing character of the *Oxalis*, which is one of the most common herbs; it is entirely destitute of any medicinal or succulent part of nearly insatiable kind; that of some dyers, the roots being sometimes used at Mecklenburg. *Isatis tinctoria* produces a purple and smoky yellow by the words of Gouan. The fruit of *Linum catharticum* and some others cannot be used for dyeing linen. *Oxalis perfoliatus* and *Linum catharticum* are employed in the medicine. The leaves of *Mercurialis annua* being green with red in the flower. The ripe berries, though somewhat narcotic, are used by the ancients for the juice of *Torilis officinalis* is used in Diocorides's diet. The leaves of *Mercurialis annua*, *Torilis officinalis*, and *Linum catharticum*, like the *Mercurialis* are yellow. During June and many others red. The flowers of *Gallipha pinnatifida* are used by the ancients for the seeds with the flavour of Lilium. The leaves of *Mercurialis annua* are sometimes eaten. Some are mentioned as troilled herbs. The leaves of *Mercurialis annua* are used in diarrhoea, dysentery, &c. The leaves of *Mercurialis* is sometimes used as a salad for pebbles, as are the leaves of *Quilicaria elaeagnus*. *Astragalus pinnatus* (the paper) and some others have a sweet leaves which is also used. Many herbs are cooked as a sauce to fish; the wood of that plant is hard, and has the fragrance. The berries of *Tristemma viridissimum* are given in the Meuse at a time. The berries of a few are aromatic, others vulnerary; but none of any name.

M. Naein, who has studied the (order 6) self-quotient groups of 14-cells, notes in the *Algebraic Combinatorics* (p. 104, 106) that  $(11)(23)H_2$  is a regular arrangement of the

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## § 1. MEASUREMENT.

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\* Please refer to the following page for details.

## Venezuela

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FIG. CCCCLXXXIX\*. *Medinilla Sieboldiana*.







## ORDER CCLXXXII. MYRTACEÆ.—MYRTLEBLOOMS.

Myrti, *Juss. Gen.* 323. (1789).—Myrtææ, *Juss. Dict. Sc. Nat.* 34. 94. (1825).—Myrtoideæ, *Vent. Tab.* (1799).—Myrtineæ, *DC. Théorie, Elem.* (1819).—Myrtaceæ, *R. Brown in Flinders.* p. 14. (1814); *DC. Dict. Class v.* 11; *Prodr.* 3. 207; *Endl. Gen.* cclxix.; *Schauer in Linnæa*, xvii. 235; *Wight Illustr.* 2. 6.—Granateæ, *Don. in Ed. Phil. Journ.* p. 134. (1826); *DC. Prodr.* 3. 3; *Von Martius H. Reg. Monac.* (1829); *Endl. Gen.* p. 1223; *Wight Illustr.* 2. 2.

DIAGNOSIS.—*Myrtal Exogens*, with a plurilocular ovary, polypetalous or apetalous flowers, an imbricated calyx, 00 stamens, oblong anthers, and usually dotted leaves.

Trees or shrubs. Leaves opposite or alternate, entire, usually with transparent dots and a vein running parallel with their margin. Inflorescence variable, usually axillary.



Fig. CCCCXC.

Flowers red, white, occasionally yellow, never blue. Calyx adherent, valvate, 4- or 5-cleft, sometimes falling off like a cap, in consequence of the cohesion of the apex. Petals equal in number to the segments of the calyx, with a quincuncial aestivation; rarely none. Stamens either twice as many as the petals, or 00, rarely equal to them in number; filaments either all distinct or connected in several parcels, curved inwards before flowering; anthers ovate, 2-celled, small, bursting lengthwise. Ovary inferior, 1-2-4-5- or 6-celled; style simple, derived immediately from the placenta; ovules usually pendulous, or erect and anatropal; occasionally peltate and amphitropal, always inserted into a central or axile placenta. Fruit either dry or fleshy, dehiscent or indehiscent. Seeds usually indefinite, variable in form; embryo without albumen, straight or curved, with its cotyledons and radicle distinguishable or blended into a solid mass.

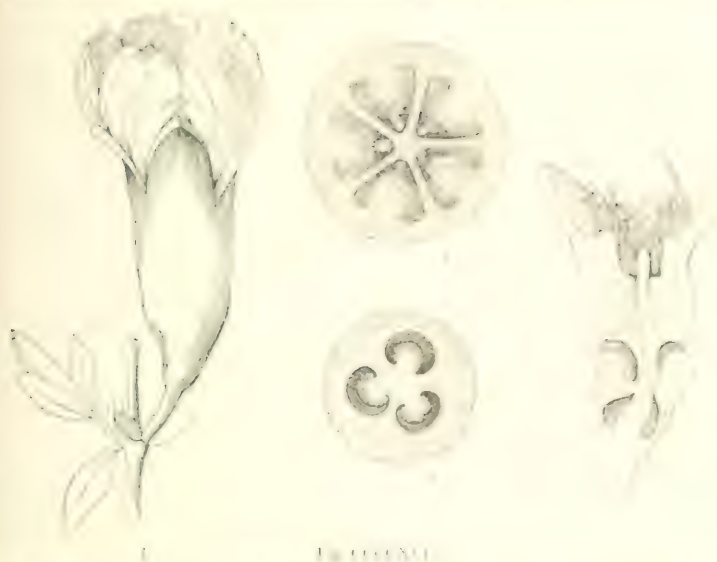
A species of *Sonneratia* is apetalous. Some dotted leaves are alternate.

One of the most natural among the tribes of plants, and the most easily recognised. Opposite exstipulate dotted entire leaves with a marginal vein, are a certain indication of it; and even where the leaves are alternate the intramarginal vein is usually discoverable. This alternation is in some species uniform, but in other instances it is accidental, as in *Myrtus communis*, which usually has opposite leaves, though, if the plant is killed to the ground by frost they are mostly alternate on the shoots that spring up again. It is closely allied to Roseworts, Lythrales, Onagraceae, Myrobalans, and Melastomads, but cannot well be confounded either with them or any other Order. It offers a singular instance of the facility with which the calyx and corolla can take upon themselves the same functions and transformations. In *Eucalyptus* the sepals are consolidated into a cup-like lid, called the operculum, and in *Eudesmia*, a nearly-

Fig. CCCCXC.—*Eugenia tuberculata*. 1. a flower; 2. the same divided vertically; 3. a stamen; 4. a ripe fruit; 5. a leaf with the dots upon it.



related points, the only results are in numerical form, since the points are transformed into an open chain. This scheme offers the curious appearance of a table and figures derived immediately and solely from the planets, a consequence of treating it parallel in this Order; and the 10 monthly, 100, for years, however.



**I O C C N E I**

Purina has been considered the type of a "patronage" system, in which he is supported by the high authority of the Cardinal, Von Muench, and Wagner.

The fruit of *Portia Gracilaria*, the *P. canaliculata*, is described by Greville and De Cussins as being divided into two unequal divisions by a horizontal diaphragm, the upper half of which consists of from 5 to 9 cells, and the lower of three; the cells of both being separated by membranous dissepiments; the pascents of the upper half proceeding from the back to the centre, and of the lower irregularly from their bottom; and by De Cussins as a fleshy mesocarpium formed by the tube of the calyx into a unilocular berry, filled with a spongy pascuum, which is hollowed out into a number of irregular cells.

In fact, if a Pomegranate is examined, it will be found to agree more or less perfectly with these descriptions. But it is clear that a fruit as thus described is at variance with the ordinary laws upon which compound fruits are formed.

A section of the ovary of the *Polypodium* in various directions, if made about the time of the expansion of the flowers before impregnation, is composed of two rows of carpels, of which three are in the bottom of the tube of the calyx, and a few these, and adhere to the upper row of the tube. As the carpels contract an irregular adhesion, which they give to the position ultimately acquired by the fruit, it assumes in the ripe fruit. If this view is correct, its peculiarity consists in this, that, as but a single row around the axis, it possesses the



The CCCCCC = 1 (Primer Orientation); 2 (perpendicular distance of the primer); 3 (area covered of a primer); 4 (near the base).

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the other, in consequence of the contraction of the tube of the calyx, from which they arise. Now, there are many instances of a similar anomaly among genera of the same Order, and they exist even among species of the same genus. Examples of the latter are, *Nicotiana multivalvis* and *Nolana paradoxa*, and of the former Malope among Malvaceæ, polycarpous Crowfoots as compared with *Nigella*, and polycarpous Rose-worts as compared with *Spiræa*. In *Prunus* I have seen a monstrous flower producing a number of carpels around the central one, and also, in consequence of the situation, upon the calyx above it; and finally, in the *Revue Encyclopédique* (43. 762), a permanent variety of the Apple is described, which is exactly to Appleworts what *Punica* is to Myrtleblooms. This plant has regularly 14 styles and 14 cells, arranged in two horizontal parallel planes, namely, 5 in the middle, and 9 on the outside, smaller and nearer the top; a circumstance which is evidently to be explained by the presence of an outer series of carpels. Dr. Wight proposes a modification of these views (*Illustrations of Indian Botany*, ii. 5), but I do not see in what respect his opinion materially differs from mine. The anomaly of the structure of the fruit of *Punica* being thus explained, nothing remains to distinguish it from Myrtleblooms but its leaves without a marginal vein, its convolute cotyledons, and pulpy seeds. There are, however, distinct traces of dots in the leaves, and the union of the venæ arcuatae, which gives the appearance of a marginal vein to Myrtleblooms, takes place, although less regularly, in *Punica*; the convolute cotyledons of *Punica* are only in Myrtleblooms what those of *Chamæmeles* are in Appleworts, a curious but unimportant exception to the general structure; and the solitary character of the pulpy coat of the seeds will hardly be deemed by itself sufficient to characterise *Granatææ*. The place of *Punica* in the Order will be probably near *Sonneratia*.

There is no instance of a blue flower in this Order. The fruit varies from succulent to dry in different genera, and in some cases is nearly superior. According to Auguste de St. Hilaire, a passage is formed from Myrtleblooms to *Onagrads* through the genus *Felicianeæ*.

Natives of hot countries both within and without the tropics; great numbers are found in South America and the East Indies, not many in Africa, and a considerable proportion of the Order in New Holland and the South Sea Islands; but the genera of those countries are mostly peculiar to them. *Myrtus communis*, the most northern species of the Order, is a native of (Persia, but has become naturalised in) the south of Europe. *Metrosideros lucida*, a beautiful tree of this Order, occurs as far to the south as Lord Auckland's Islands, in lat. 50½ S.—*J. Hooker*.

De Candolle remarks, that although they all, without exception, have a woody texture, yet that they vary prodigiously in stature, from the little *Myrtus nummularia* which spreads over the soil in the Falkland Islands, as *Thyme* does in Europe, to the immense Gum-trees (*Eucalypti*) of New Holland, which are among the most gigantic trees of Australasia. There are all sorts of intermediate sizes, but the common Myrtle-bush gives a tolerably good idea of the appearance of the majority. Mr. Backhouse speaks of some of the Gum-trees as rising to about 200 feet in height, with straight trunks clear of branches from 100 to 150 feet, and resembling an assemblage of elegant columns, so irregularly placed as to intercept the view at the distance of a few hundred yards. These are elegantly crowned with branching tops of light willow-like foliage. Some of what are called Stringy bark Gum-trees, "rise nearly as high as the Monument without branching!" The *Aki*, a New Zealand plant of this Order, the *Metrosideros buxifolia*, of Allan Cunningham, is described by that Botanist as being a rambling shrub, adhering to trees, and by its lateral roots climbing to the summit of the loftiest timber in the forests of Wangaroa, Bay of Islands, &c.

The pellucid dotting of the leaves and other parts indicates the presence of a fragrant aromatic or pungent volatile oil, which gives the principal quality to the produce of the Order. To this are due the grateful perfume of the Guava fruit, the powerful aroma of the flower-buds of *Caryophyllus aromaticus*, called by the English Cloves, and the balsamic odour of those eastern fruits, the Jamrosade and the Rose Apple. Along with this is frequently mixed an astringent principle, which sometimes predominates, to the suppression of any other property. The Guavas are pulpy fruits inhabiting the western world, whence they have been carried to the eastern; the principal are *Psidium pyrifera* and *pomifera*, the latter of which is much more acid than the other. They make with sugar a cooling and rather astringent conserve. The berries of other species of *Psidium*, which grow plentifully on the campos of S. Paulo, and are distinguished by the name of *Guabinoba*, are used in a similar manner. The young bark and leaves are employed as astringents, and the latter for medicated baths, which are very customary in Brazil; other species, especially *P. Cattleyanum*, also bear a fruit of excellent quality. *Eugenia cauliflora*, the Jabuticaba or Jaboticaburas, is one of the most agreeable fruits in Brazil, and the taste will be improved by further culture. Very good



[illegible]

As a spice, every one is acquainted with *Caryophyllus* growing wild in a common rocky far mountain, and which is the same which has the name of *Caraway*. Those of *Caryophyllus* attracted first by aromatic qualities. The fruit is called All-spice or Pimento, is the dried fruit of *Persea* *peruviana* and *Eugenia* of the plant, especially the unripe fruit, alludes to an essential oil, which is supposed to be in the stomach, promoting digestion, and astringent. *Hamamelis*. The fruit of *Caryophyllus* is used in the same way as Brazil, and in *Myrica* *peruviana* of the Myrtle buds and berries (*Myrica* *peruviana*) being given in dysentery, the berries are still used in Tuscany as a stomachic. The *Myrica* *peruviana* is a small tree of the wine, which they call *Myrtidatum*. The distilled water of *Myrica* *peruviana* has an agreeable perfume known in France under the name of *eau d'orange*. The leaves of *Syzgium* *terbinthaceum* are used in Malabar as a tonic. The *Myrica* *peruviana* found both sides of its leaves covered with very minute glandular hairs, being at the apex a knob of brownish matter. *Am. N. Hist. 8. 114.* The essential oil, or stimulant oil of *Cajuputi* is distilled from the leaves of *Myrtidatum* *Cajuputi*, and is well known as a powerful sudorific, and useful external application in various fevers. It is considered carminative, cephalic, and emmenagogue, and is a powerful, highly diffusible stimulant, antispasmodic and anaphrodisiac. It has also the power of dissolving caoutchouc, and possesses a great reputation as a remedy to induce

As simple astrinents several deserve notice. A kind of gum resin is yielded by *Eucalyptus resinifera*, which is occasionally sold in the medicine shops of India. Other species of *Eucalyptus* yield a large quantity of tannin, which has been extracted from the trees in New Holland, and sent to the English coast. The leaves of the common Myrtle, dried in a stove and powdered, have been sometimes used as astringent; those of *Eugenia depauperata* and *acardata* are used as astringents in Brazil. The Pomegranate, *Punica Granatum*, commonly cultivated in the warm parts of Europe, and forming entire woods in Persia, has long been celebrated in medicine; a decoction of the bark of the root is a powerful astringent, and the flowers are tonic and astringent, as is the bark of the fruit, which is used in chronic dysentery, &c.; the acid juice of the seeds is found useful in leucorrhœa.

Some species secrete a sweet manna-like gum. *Eucalyptus polydon* exudes large cavities in its stem, between the natural exsufflatory streaks of resinous gum, a most beautiful red or rich vermilion-colored gum; and *E. mannifera*, on New Holland, exudes a saccharine mucous substance resembling *Manna manna* and *Myrica*, but less mucous. It is not produced by this tree, and only appears to be by accident. Other species yield a similar secretion at Marion Bay and in Van Diemen's Land. Mr. Backhouse says it coagulates and drops from the branches of *E. polydon* as an almond. *Eucalyptus Gunnii*, when wounded, furnishes the natives of New manna with a copious supply of a cool, refreshing, slightly aromatic liquid, which ferments and acquires the properties of beer. *Leuca leucos*, *Myrica*, &c. The leaves of *Glaphyria nitida*, called by the Malays the Tree of Life (Kuta), *Myrica*, &c. "probably from its maintaining itself at elevations where the other trees of the forest have ceased to exist," adduced by Kuhn, and called by the Malays, and by the natives by the name of the Tree of Life, and various names of *Myrica*, &c. Melaleuca bear the same name in the *Australasie*.

The wood of Myrtleblossoms is said by De Candolle to be generally soft and compact but the heavy, hard, dark-brown timber, which furnish the shields and spears and their clubs and other weapons, is said to come from *M. laurifolia* and *M. laurifolia*, or some allied species. The *Ahi*, or *Logan* vine of New Zealand, the *Uru*, and the *Uru* trees, of the same country, are all hard-wooded trees belonging to the same family.

6. 2. 1. 1.

I. LEPTOSPERMEÆ. —  
Capsular

Astarten, DC.  
Tristana, R. Br.  
Sylcarpia, T. Br.  
Rumpfen, Noss.  
Lophostemon, Schott.  
Lamarckia, G. & H.  
Calothamnus, L. & H.

*Pteris*, Linn.  
Hollborn, Colla.  
Bourdingia, R. Br.  
*Schizanthus*, Lindl.  
**Manglesia**, Lindl.  
Crotalaria, Jacq.  
McAlister, Linn.  
Chrysomelid, Athys.  
Eucalyptus, H. B.

A. ...  
 B. ...  
 C. ...  
 D. ...  
 E. ...  
 F. ...  
 G. ...  
 H. ...  
 I. ...  
 J. ...  
 K. ...  
 L. ...  
 M. ...  
 N. ...  
 O. ...  
 P. ...  
 Q. ...  
 R. ...  
 S. ...  
 T. ...  
 U. ...  
 V. ...  
 W. ...  
 X. ...  
 Y. ...  
 Z. ...



*Fabricia*, Gärtn.  
*Bæckeia*, Linn.  
*Imbricaria*, Smith.  
*Jungia*, Gärtn.  
*Mollia*, Gmel.  
*Cedrela*, Lour.  
*Babingtonia*, Lindl.

## II. MYRTEÆ.—Baccate.

*Sonneratia*, Linn. f.  
*Aubletia*, Gärtn.  
*Pagapate*, Sonner.  
*Blatti*, Rheed.  
*Punica*, Linn.

*Nelitris*, Gärtn.  
*Decaspermum*, Forst.  
*Campomanesia*, R. et P.  
*Psidium*, Linn.  
*Guaiava*, Tournef.  
*Burchardia*, Neck.  
*Rhodamnia*, Jack.  
*Monoxora*, Wight?  
*Glaphyria*, Jack.  
*Pimenta*, Lindl.  
*Myrtus*, Tournef.  
*Leucomyrtus*, DC.  
*Myrtillus*, Endl.

*Leantria*, Soland.  
*Jossinia*, Comm.  
*Rhodomyrtus*, DC.  
*Myrcia*, DC.  
*Syllisium*, Schauer.  
*Marlierea*, St. Hil.  
*Calyptanthus*, Swartz.  
*Chytraculia*, P. Br.  
*Zuzygium*, P. Br.  
*Chytralia*, Adans.  
*Calyptanthus*, Juss.  
*Syzygium*, Gärtn.  
*Opa*, Lour.

*Calyptanthus*, Blum.  
*Jambolifera*, Auct.  
*Caryophyllus*, Tournef.  
*Acmena*, DC.  
*Eugenia*, Michel.  
*Plinia*, Linn.  
*Guapurium*, Juss.  
*Olinthia*, Lindl.  
*Greggia*, Gärtn.  
*Jambosa*, Rumph.  
*Jambos*, Adans.  
*Cercocarpus*, Hssk.

NUMBERS. GEN. 45. Sp. 1300.

POSITION.—Melastomaceæ.—MYRTACEÆ.—Onagraceæ.  
*Pomaceæ.*



Fig. CCCCXIII.

Fig. CCCCXIII.—1. twig of *Myrtus communis*; 2. a flower divided perpendicularly.

For remarks on *Punica*, consult Payer in *Comptes Rendus*, Oct. 18, 1852. According to Blume, *Rhodamnia*, Jack, is certainly a member of this Order; but it is possible that *Glaphyria* is related to *Vaccinium*, as is certainly the case with *Myrtus Vulcani* of Korthals. The leaves of *Myrtus nummularia* are diuretic, and have been used by the settlers in the Falkland Islands as a substitute for tea; the berries are sweet and agreeable.—*Hooker, f.*

## ADDITIONAL GENERA.

*Balaustion*, Hooker, near *Hypocalymma*.  
*Macklotia*, Korths. = *Leptospermum*.  
*Cleistocalyx*, Bl. near *Eugenia*.  
*Macropsidium*, Bl. near *Psidium*.  
*Gilpkea*, Bl.  
*Strongylocalyx*, Bl.  
*Clavimyrthus*, Bl.  
*Microjambosa*, Bl. } near *Jambosa*.

? *Mongezia*, Fl. Flum.

*Olinia*, Thunb.  
*Cremastemon*, Hort.  
*Myrrhinium*, Schott.  
*Felicianea*, Cambess.  
*Tetrastemon*, Hook.  
*Fenzlia*, Endl.

The last two genera are referred here upon the authority of M. Naudin, who regards *Olinia* as the type of a peculiar Natural order. *Germaria*, Presl., said by that author to be near *Leptospermum*, has been shown by Mr. Benthams not to be a *Myrtad* at all, but a species of *Pygeum*.



## ORIGINAL COLUMN. LOSTHEDGECRE. 1.

Lorythodon. Richard, M.S., *Pontes de*. Mus. Ind. 140. (1896). [?].  
*Ich. Richard en Inde des S.*, 1. (21), L. Ind. Mus. 5. (1897).  
*Fish Gen.*, p. 1284. Merriam, 1899.

Diagnosis: *Megatylus*  $\times$  *E. caeruleus*, with a *Pl.* intermediate among *polydora* forms, a pale, un-  
 riplicated *capitulum* (no *capitulum* in *Pl.*), and a flat, heavily armed body with  
 dotless bristles.

Large trees, with alternate entire or toothed leaves, some reddish underneath, with pellucid dots. Flowers large, showy, terminal, solitary, or racemes.



Fig. CCCCXCIV

germination of *Leucythis*, see *D. P. F. Fernald*, *Journ. of the Washington Acad. Sci.* 1916, 10, 129-130. *Leucythis* and *Leucythis* are in many respects, but they have stipules, and their seeds are not so large as those of *Leucythis*. The number of stamens is most remarkable. There are many stamens in the flower, but only a few of them are fertile by their seeds having no power to germinate in the soil, and only a few of them are fertile by their stamens.

Among other attributes is that of often forming a large double bowl at the base of an urn, from which the top spontaneously separates at the point of a fall.

Natives of the hottest parts of South America, especially of Brazil,

Fig. CCCXCIV.—*Leeythus ovalis*.—1. Longitudinal section of a flower (upper part); 2. stamen.



The fruit of *Couroupita guianensis*, or the Cannon-ball tree, called Abricot sauvage in Cayenne, is vinous and pleasant when fresh, but in decay emits an insupportably offensive odour. The lacerated parts of its flowers become blue upon exposure to the air. The shells are used, like the calabash, for domestic purposes. The most gigantic tree in the ancient forests of Brazil is that called the Sapucaya. It is the *Lecythis ollaria*, the seeds of which are large and eatable, as are those of all the species of *Lecythis*, but they leave a bitter unpleasant after-taste in the mouth. A milky emulsion, prepared from the seeds of *L. grandiflora*, is used in Brazil in catarrhs. The bark of *L. ollaria* is easily separable, by beating the liber into a number of fine distinct layers, which divide so neatly from each other, that, when separated, they have the appearance of thin satiny paper. Poiteau says he has counted as many as 110 of these coatings. The Indians cut them in pieces, as wrappers for their cigars. The well-known Brazil nuts of the shops of London are the seeds of *Bertholletia excelsa*. The great woody pericarps of *Lecythis* serve as drinking-vessels.

# GENERA.

*Couratari*, Aubl.

*Lecythopsis*, Schrank.

*Cariniana*, Casar.

*Lecythis*, Lüffl.

*Eschweilera*, Mart.

*Bertholletia*, Hb. et Bpl.

*Tonca*, Rich.

*Couroupita*, Aubl.

*Pontoppidana*, Scop.

*Elsholtzia*, Rich.

? *Crossostylis*, Forst.

NUMBERS. GEN. 7. Sp. 38.

POSITION.—Myrtaceæ.—LECYTHIDACEÆ.—Rhizophoraceæ.  
Cactaceæ?

According to Spruce it is a species of *Lecythis* distinct from *L. ollaria*, from which wrappers for cigars are made in Brazil.

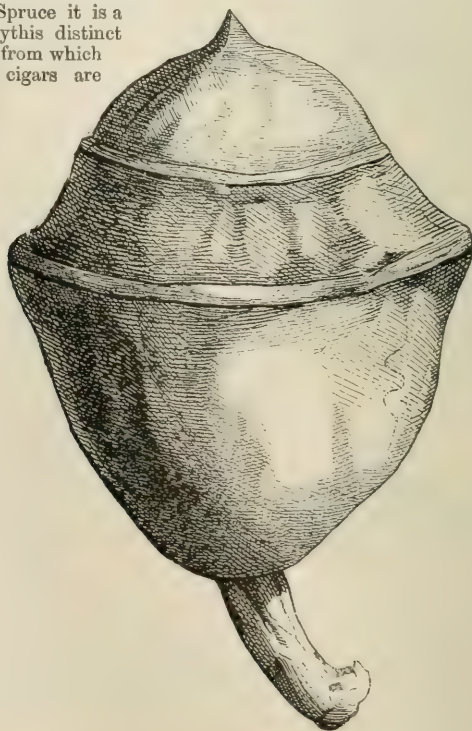


Fig. CCCCXCV

Fig. CCCCXCV.—Fruit of *Lecythis grandiflora*.—Aubl



## ALLIANCE III. CACTACEÆ.—THE CACTAL ALLIANCE.

DIAGNOSIS.—*Ephemera* *lanceolata*, with *distichophyllon* *polycarpum* *lanceolata*, *polycarpum*, *plumbeum*, and *polycarpum* with *polycarpum* and *plumbeum*.

Their parietal placentation separates Cactaceæ from all Epiphyllum-like alliances, the Grossal, and the latter is known by the narrow calyxes and sepals free alliance.

The Orders at first sight appear very different: but it is not until we compare the succulence of Indian Figs, their dissimilarity disappears. The flowers among Leucads is much like an Epiphyllum in its flowers, and the difference between Homalium and Mentzelia or Acroclasia is inconsiderable. In fact, the genus of the order is Homalium may be regarded as another form of the succulent plants of some families.

The Alliance touches Cucurbits by way of such Leucads as Homalium-like, through Bartonella, Ficoids (Mesembryaceæ) through Indian Fig, and Pseudocypripedium through such plants as the Homalium Blackwellia.

## NATURAL ORDERS OF CACTACEÆ.

<i>Sepals and petals distinct. Stamens opposite the petals. Style</i>	} 1776. <i>Homalium</i> 1776.
<i>separate. Ovary pendulous.</i>	
<i>Sepals and petals distinct. Stamens scattered. Style confluent.</i>	} 1776. <i>Homalium</i> 1776.
<i>Ovary pendulous. Seeds numerous.</i>	
<i>Sepals and petals numerous, and distichous. Stamens scattered. Style confluent. Ovary horizontal. Seeds without albumen.</i>	} 1776. <i>Homalium</i> 1776.



## ORDER CCLXXXIV. HOMALIACEÆ.—HOMALIADS.

Homalineæ, *R. Brown in Congo*, (1818); *DC. Prodr.* 2. 53. (1825); *Endl. Gen.* exxvi.; *Meisner*, p. 73.

DIAGNOSIS.—*Cactal Exogens*, with distinct sepals and petals, stamens opposite the petals, separate styles, and pendulous ovules.

Trees or shrubs. Leaves alternate, with deciduous stipules, or 0, toothed or entire. Flowers in spikes, racemes, or panicles, without bracts. Calyx funnel-shaped, adherent,

with from 5 to 15 divisions. Petals alternate with the segments of the calyx, and equal to them in number. Glands present in front of the segments of the calyx. Stamens arising from the base of the petals, either singly or in threes or sixes; anthers 2-celled, opening longitudinally. Ovary adherent, 1-celled, with numerous anatropal pendulous ovules attached to 2, 3, or 5 parietal placenta; styles from 3 to 5, simple, filiform, or subulate. Fruit berried or capsular. Seeds small, ovate, or angular, with an embryo in the middle of a little fleshy albumen, and a thick superior radicle.

Although these plants, with shrubby stems, small flowers, and highly-developed leaves, exhibit no other resemblance to Indian Figs than what resides in their inferior ovary, parietal placenta, and scarcely albuminous seeds, yet, if we compare them with Loasads, their affinity becomes sufficiently evident; and as Loasads are akin to Indian Figs in the first degree, so Homaliads are akin in the second degree. That Homaliads and Loasads stand nearly on the same line, is shown by comparing such plants as *Homalium* with *Acrolasia*; and although it



Fig. CCCCXCVI.

cannot be denied that links are wanting to render the connection between those genera complete, yet enough of resemblance exists to warrant this sort of comparison. In fact, the glands of *Homalium* are probably an altered form of the abortive stamens of *Loasa*.

According to Brown, Homaliads are related to Passionflowers, especially to *Smeathmannia*, from which their inferior ovary distinguishes them, to say nothing of their want of stipules and glands on the leaves, of the presence of glands at the base of the floral envelopes, and of their erect and very different habit. De Candolle places them between *Samyds* and *Chailletids*, describing them as apetalous, but classing them with his *Dichlamyds*; Brown also understands them as without petals; but I confess I cannot comprehend what petals are, if the inner series of the floral envelopes of these plants be not so; an opinion which their supposed affinity with Passionflowers would confirm, if analogy could be admitted as evidence in cases which can be decided without it. The statement of De Candolle, that the stamens are opposite the sepals, is inaccurate; they are, as Brown describes them, opposite the petals.

The species are all tropical, and chiefly African or Indian. Four or five are described from the West Indies and South America.

The root of some American species of *Homalium* is astrigent, and employed against blennorrhœa.

Fig. CCCCXCVI.—*Byrsanthus Brownii*.—*Dellessert*. 1. diagram of the flower; 2. section of a flower, 3. section across the ovary; 4. section of a seed.



## GENERA

*Homalium*, Juss.  
*Amorpha*, Adans.  
*Nyctanthes*, Aubl.  
*Leptocarpus*, Scop.  
*Rourea*, Lam. Aubl.

*Leptocarpus*, Scop.  
*Homalium*, Juss.  
*Amorpha*, Adans.  
*Nyctanthes*, Aubl.  
*Leptocarpus*, Scop.  
*Rourea*, Lam. Aubl.

*Amorpha*, Adans.  
*Nyctanthes*, Aubl.  
*Leptocarpus*, Scop.  
*Rourea*, Lam. Aubl.

NUMBERS. Genus  $\bar{P}$  Sp. 30

*Platanus*, L.

POSITION. LAMINACEAE. HOMALIACEAE. CACEALES.



## ORDER CCLXXXV. LOASACEÆ.—LOASADS.

Loasææ, *Juss. Ann. Mus.* 5. 18. (1804); *Dict. Sc. Nat.* 27. 93. (1823); *Kunth in Nov. Gen. et Sp.* 6. 115. (1823); *DC. Prodr.* 3. 339. (1828); *Endl. Gen.* cxcix.; *Meisner*, p. 125.—*Gronovixæ*, *Endl. Gen.* p. 940.

DIAGNOSIS.—*Cactal Exogens*, with distinct sepals and petals, scattered stamens, confluent pendulous ovules, and albuminous seeds.

Herbaceous plants, hispid, with pungent hairs secreting an acrid juice. Leaves opposite or alternate, without stipules, usually more or less divided. Peduncles axillary, 1-flowered. Calyx adherent, 4- 5-parted, persistent, imbricated, and spreading in æstivation. Petals 5 or 10, in two rows, often hooded, with an inflexed, valvate, or contorted æstivation; the interior often, when present, much smaller than the outer, and truncate at the apex. Stamens ∞, in several rows, arising from within the petals, either distinct or adhering in bundles before each petal, within the cavity of which they lie in æstivation; filaments subulate, unequal, the outer ones frequently destitute of anthers. Ovary inferior, 1-celled, with several parietal placentæ, or one only in the centre; style single; stigma 1, or several. Ovules anatropal, pendulous, rarely 1. Fruit capsular or succulent, inferior, 1-celled, with parietal placentæ originating at the sutures. Seeds without aril; embryo lying in the axis of fleshy albumen, with the radicle pointing to the hilum, and flat small cotyledons.

The relationship of this Order seems to be almost equally divided between Indian Figs and Onagrads, and hence it must stand on the limits of the Myrtal and Cactal Alliances. From the former,



however, it differs most, in consequence of its parietal placentation and 1-celled ovary. It is through *Pereskia* that it passes into Indian Figs, for that genus, if it were to lose its succulence, would almost belong to Loasads; the species of *Rhipsalis* too, in which there is a clear distinction between the calyx and corolla, offer another easy transition from Indian Figs to this Order, by way of *Bartonia*. But while such may be regarded as the most immediate affinity of Loasads, there are others so little remote as to show that among the Epigynous class we have distinct traces of a near parallelism with both the hypogynous and diclinous sub-classes. The first is indicated by the similarity in habit of *Blumenbachia*, &c., to *Passionflowers*, in connection with the great tendency which such genera exhibit to convert their stamens into petaloid processes; and, as *Endlicher* remarks, there is also a plain approach to *Turnerads* and *Crownworts*, two other Orders of the Violal Alliance. The relation to diclinous Endogens consists in the resemblance between Loasads and *Cucurbits*; a similarity so great, that little serves to distinguish them, except the diclinous flowers and short sinuous anthers of the latter; in fact, the genus *Sphenantha*, referred to *Cucurbits*, is probably a Loasad if it belongs to either the one Order or the other. *Gymnotheca* is a very anomalous plant, with neither calyx nor corolla; *Decaisne* refers it to *Saururads*, p. 251.

All the species are American, and chiefly from the more temperate regions, or the tropics, of either hemisphere.

Fig. CCCCXCVII.—*Bartonia albaucalis*. 1. a flower; 2. ring of stamens; 3. cross section of seed-vessel; 4. seeds.



Except the stinging property which results in the leaves of some species, little is known of the qualities of these plants. *Miconia lewisii*, a Mexican shrub, is said to have a purgative root.

## GENERA.

I. LOASACEAE.	Liliaceae, Lili.	Cypripedium, Pterid.	Q. Gallotrichum.
<i>Acrostichum</i> , Presl.	<i>Agave</i> , H. & A.	<i>Agave</i> , H. & A.	<i>Agave</i> , H. & A.
<i>Montezuma</i> , Lili.	<i>Saururus</i> , Presl.	<i>Saururus</i> , Presl.	<i>Saururus</i> , Presl.
<i>Crucianella</i> , Lili.	<i>Crucianella</i> , Lili.	<i>Crucianella</i> , Lili.	<i>Crucianella</i> , Lili.
<i>Carpodanthus</i> , Lili.	<i>Carpodanthus</i> , Lili.	<i>Carpodanthus</i> , Lili.	<i>Carpodanthus</i> , Lili.
<i>Trachypogon</i> , Nutt.	<i>Trachypogon</i> , Nutt.	<i>Trachypogon</i> , Nutt.	<i>Trachypogon</i> , Nutt.

NUMEROUS, Gen. 1. 189, 240.

Posipus, Homalium, Liliaceae, Cypripedium, Cypripedium.

## ADDITIONAL GENERA.

*Microsperma*, H. & A. 189, 240.  
*Amorpha*, Presl. & Montezuma.  
*Liliaceae*, Lili.



THE CUCURBIT.

THE CUCURBIT, Liliaceae, Cypripedium.



## ORDER CCLXXXVI. CACTACEÆ.—INDIAN FIGS.

Cacti, *Juss. Gen.* 310 (1789) *in part*.—Cactoideæ, *Vent. Tabl.* 3. 289. (1799).—Opuntiacæ, *Juss. Dict. Sc.* 144. (1825) *in part*; *Kunth. Nov. G. et Sp.* 6. 65.—Nopalæ, *DC. Théorie Élém.* 216. (1819).—Cactæ, *DC. Prodr.* 3. 457; *Revue des Cactées Mem. Mus.* (1829). *Link and Otto in Verhand. des ver. Gart. Preuss. vol. iii. p. 412. Martius in Act. Acad. Nat. Cur. XVI.; Lemaire Cact. Hort. Monv.* (1838); *Id. Cactearum Gen. Nov.; Miquel in Bull. Sc. Phys. en Neerlande*, 1839. p. 89. 118; *Pfeiffer. Enum. Cact.; Walpers Repertorium*, 2. 269; *Salzm. Dyck. Hortus Dyckensis*, 1842; *Endl. Gen. civ.; Wight. Illustr.* 2. t. 114.; *Schleiden Beiträge zur Anatomie der Cacteen; Miquel in Ann. Sc. Nat.* 19. 165.

DIAGNOSIS.—*Cactal Exogens*, with the sepals and petals numerous and undistinguishable, scattered stamens, confluent styles, horizontal ovules, and seeds without albumen.

Succulent shrubs, very variable in form. Stems usually angular, or two-edged, or leafy. Wood either arranged in a ring of wedges separated by wide medullary passages, or consisting of fibres loosely interlacing, and only collecting in compact zones when old. Leaves almost always wanting; when present, fleshy, smooth, and entire, or spine-like. Flowers either showy or minute, usually lasting only one day or night, always sessile. Sepals numerous, sometimes 4, but usually indefinite, and confounded with the petals, either crowning the ovary, or covering its whole surface. Petals 4 or more, commonly numerous, usually indefinite, arising from the orifice of the calyx, sometimes irregular. Stamens indefinite, more or less cohering with the petals and sepals; filaments long, filiform; anthers ovate, versatile. Ovary fleshy, inferior, 1-celled, with numerous ovules arranged upon parietal placentæ, equal in number to the lobes of the stigma; style filiform; stigmas numerous, collected in a cluster. Fruit succulent, 1-celled, many-seeded, either smooth, or covered with scales, scars, or tubercles. Seeds parietal, or, having lost their adhesion, nestling in pulp, ovate or obovate, without albumen; embryo either straight, curved, or spiral, with a short thick radicle next the hilum; cotyledons flat, thick, foliaceous, sometimes almost obsolete in the leafless species.

That remarkable distension or increase of the cellular tissue of plants, from which the name of succulent is derived, is no indication of natural affinity, but is rather to be

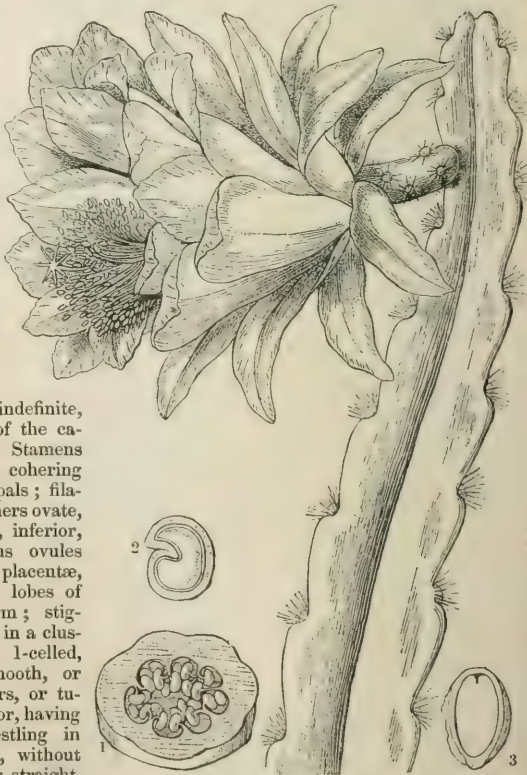


Fig. CCCCXCVIII.

Fig. CCCCXCVIII.—*Cereus speciosissimus*. 1. section of the fruit of *Opuntia Dillenii*; 2. of the seed, (*Gartner*); 3. section of seed of *Mammillaria*.



considered a modification of structure common to all Orders. However, numerous relationships of Indian Figs is neither with *Spergularia*, nor *Caryophyllæ*, nor *Asphodels*, all of which contain a gradual or less marked set of mutational points. Through *Rhipsalis*, which is said to have ancestral elements, they seem connected with *Portulacæ*, to which also the current strategy of the leaves of *Opuntia* generally indicates an approach. De Candolle further traces an affinity to another genus, *Pseudos* (*Mesembryaceæ*), which correspond to most more or less potent Indian species (embryo, and somewhat in phloemation), but which have a many-sided view belonging to the perigenous rather than the epigeal-embryo. The strategy of Indian Figs has engaged the especial attention of scholars; Miquel and others, whose observations will be found in the place above quoted. One of the most curious circumstances connected with it is that their spiral veins are extremely rare, and are formed with a spiral plate of cuticle-like breadth and thickness, which is a thread. For an elaborate account of this Order see Schimper's *Mammillariaceæ* (1890). Currantworts, with which Indian Figs were formerly connected, naturally differ in a large number of points, and especially in their almost alluring.

In this country we scarcely know the Indian Figs except as exceedingly ugly shrubs without leaves, but the Persians have learned a sufficiently ordinary description, and when old the columnar species form wood of considerable strength. Indeed, according to Mr. Huxley, *Ann. Nat. Hist.* (190), Humboldt speaks of a forest of such plants, not very common species, but tall trees with stems yielding wood suitable for domestic purposes. It has been well observed by Dr. Wiegman (*Wiegman's Journal Systematica*, vol. I, p. 209) that the confusion of species and genera in the Order of Indian Figs is without a parallel, owing to the negligence and bad descriptions at once of writers, cultivators, and travellers, and that the so-called species are in many cases distinguished by characters of the most trifling nature.

America is the exclusive station of the Order, its species appearing to be native of any other part of the world. In that country they are abundant in the tropics, extending a short distance beyond them, even to both to the north and the south. De Candolle states that 12°–16° north latitude is the northern limit of the Order; but it is certain that a species is now wild or naturalised in Long Island, in latitude 40° north, and that there is another where about 42°, in the Rocky Mountains. Those which are said to be wild or naturalised in Europe, Mauritius, Arabia, and China, are either species of *Opuntia* (Leprieux &c.), or, if really Indian Figs, have been introduced from America, and having found themselves in situations suitable to their habits, have taken possession of the land and actual natives: in Europe this does not extend beyond the town of Chios (p. 10), some latitude. There is no reason for supposing that the eastern *Opuntia* is descended from Theophrastus, as Sprengel asserts; the account of the former writer, as far as it applies to anything now known, rather suits some tree-like *Ficus religiosa*. Hot, dry, open places are the favourite stations of Indian Figs, for which they have peculiar adaptations, in consequence of the imperfect evaporating power of the thick & scaly skin, which, as De Candolle has shown, accounts for the excessively succulent state of these stems. For geographical observations see *Mammillariaceæ*, Aug. 8, 7, and 9, 1890.

The fruit is very similar in its properties to that of Currants, or some young *Berberis*, and agreeable to the taste, in others mucilaginous and insipid. Many are valued as palliatives of intermittent and lacerating fevers, as consequence of their refreshing and juicy. The fruit of *Opuntia vulgaris* has the property of soothing and the removal of those who eat it. That of *O. Tuna* is of the richest colour, and forms a valuable pigment, employed at Naples as a water-colour. The juice of *Mammillaria* is considered for being slightly milky, and at the same time sweet and insipid. *Berberis peruviana* is not only the succulent fruit of the Order, but is brewed and used as a stimulant for ill-conditioned ulcers.—*Martius*. The fruit of *Peruvia* is said to be pleasant and refrigerant. The great fleshy stems of some *Mammillaria* species are used by some; a very remarkable specimen of this kind is described by Sir W. Huxley, in the *Chronicle*, 1845, p. 132. Mr. Darwin found that a species of *Opuntia* that occurs in the principal kinds of food of the birds at the Galapagos.



FIG. CCCCXIX.—Two *Opuntia* fruits, one of Indian Figs.



## GENERA.

I. MELOCACTIDÆ.	II. ECHINOCACTIDÆ.	Cereus, Howorth.	Hariota, Lemaire.
Melocactus, <i>C. Bauhin.</i> Discocactus, <i>Pfeiffer.</i> Anhalonium, <i>Lemaire.</i> <i>Ariocarpus</i> , Sch. Mammillaria, <i>Howorth.</i>	Echinocactus, <i>L. et O.</i> <i>Astrophytum</i> , Lem. Pelecypora, <i>C. Ehrenb.</i>	IV. PHYLLANTHIDÆ. Phyllocactus, <i>Link.</i> Epiphyllum, <i>Pfeiffer.</i> Disocactus, <i>Lindley.</i>	VI. OPUNTIDÆ. Opuntia, <i>Tournefort.</i>
	III. CEREIDÆ.	V. RHIPSALIDÆ.	VII. PERESKIDÆ.
	Echinopsis, <i>Zuccarini.</i> Pilocereus, <i>Lemaire.</i>	Rhipsalis, <i>Gartner.</i>	Pereskia, <i>Plumier.</i>

NUMBERS. GEN. 16. Sp. 800 ??

*Mesembryaceæ.*

POSITION. ——— — CACTACEÆ.—Loasaceæ.

*Grossulariaceæ.*

## ADDITIONAL GENERA.

Pleiffera, *Salm.* near Rhipsalis.| Leuchtenbergia, *Salm.* near Anhalonium.







## ORDER CCLXXXVII. GROSSULARIACEÆ.—CURRANTWORTS.

Grossulariæ, *DC. Fl. Fr.* 4. 406. (1804); *Kunth Nov. G. et Sp.* 6. 58.; *DC. Prodr.* 3. 477. (1828); *Spach in Ann. Sc. ser. 2. tom. 4. p. 16.*—Ribesiæ, *Ach. Rich. Bot. Med.* 2. 487. (1823).—Grossulacæ, *Mirb. Elem.* 2. 897. (1815).—Ribesiaceæ, *Endl. Gen. clxxi.* (1839).

DIAGNOSIS.—*Grossal Exogens, with pulpy fruit and parietal placente.*

Shrubs, either unarmed or spiny. Leaves alternate, lobed, with a plaited veneration, often with a membranous edge to the base of the petioles. Flowers in axillary racemes, with bracts at their base, rarely unisexual by abortion. Calyx superior, 4- or 5-parted, regular, coloured, imbricated, or somewhat valvate in æstivation. Petals 5, minute, inserted in the throat of the calyx. Stamens 5, inserted alternately with the petals, very short. Ovary 1-celled, with 2 opposite parietal placente; ovules numerous, on short stalks, anatropal; style 2-3-4-cleft. Berry crowned with the remains of the flower, 1-celled; the cell filled with pulp. Seeds numerous, suspended among the pulp by long filiform cords; testa externally gelatinous, adhering firmly to the albumen, which is horny; embryo minute, with the radicle next the hilum.

Notwithstanding the great dissimilarity in the appearance of these plants and Indian Figs, the two Orders were formerly confounded, and are still accounted by many writers conterminous, chiefly on account of their both having inferior pulpy fruit and parietal placente. Von Martius, however, (*Conspectus*, No. 222,) abandons this view, and stations them somewhere between Saxifrages and Onagradæ. In consequence of their copious albumen, polypetalous flowers, and definite stamens, I was formerly disposed to bring them into the neighbourhood of Berberries and their allies; but the strictly epigynous structure of the flowers weakens this resemblance. That they stand near Escalloniads seems undoubted, and therefore they form a transition to Cranberries, another Order in close contact with Escalloniads, but stationed in the Cinchonall Alliance because of its monopetalous corolla. The close alliance between Currantworts and Escalloniads is most distinctly shown by the genus *Polyosma*, which agrees with the former in its two polyspermous parietal placente, and with the latter in the high development of its corolla. Mr. Bennett even places it among Escalloniads.

They are natives of the mountains, hills, woods, and thickets of the temperate parts of Europe, Asia, and America, but unknown in Africa. In North America they are particularly abundant, and on the mountains of Northern India they contribute to give a European character to that remarkable region. In the tropics of Asia and the South Sea Islands they occur in the form of *Polyosma*, a genus which derives its name from the excessive fragrance of its flowers.

The properties of the Gooseberry and Currant are those of the generality of the Order, except that in other species a mawkish or extremely acid taste is substituted for the refreshing and agreeable flavour of the former. Some are said to be emetic and intoxicating (*R. inebrians*), but this statement rests on no good authority. The black

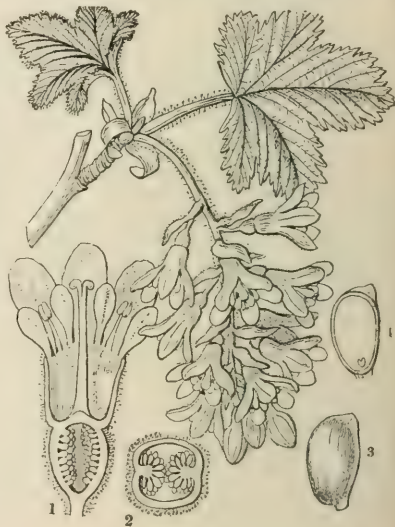


Fig. D.

Fig. D.—*Ribes rubrum*. 1. perpendicular section of a flower; 2. cross section of the ovary; 3. seed; 4. a perpendicular section of it.



Current, which is tonic and stimulant, has fragrant berries; but these reservoirs are also found upon some other species. Berries much used as Currants and Gooseberries. *Tanger, G. & L.*

## GENERA

<i>Ribes</i> , Linn.	<i>Grossular</i> , Spach.	<i>Elaeagnus</i> , Desf.	<i>Opuntia</i> , Mill.
<i>Grossularia</i> , Tournef.	<i>Lathyrus</i> , Linn.	<i>Asclepias</i> , Linn.	<i>Quercus</i> , Linn.
<i>Antirrhinum</i> , A. Rich.	<i>Corydalis</i> , Spach.	<i>Urtica</i> , Linn.	<i>Urtica</i> , Linn.
<i>Calobryza</i> , Spach.			

NUMBERS: GEN. 21. Sp. 17.

Triennial.

POSITION.—Philadelphiae. — *Grossularia* & *Opuntia* — *Urtica* & *Calobryza*.

For remarks on Polytrichum, p. 276.



## ORDER CCLXXXVIII. ESCALLONIACEÆ.—ESCALLONIADS.

Escalloniæ, R. Brown in *Franklin's Voyage*, 766. (1824); *Aug. de St. H. Fl. Bras.* 3. 92. (1833).—Saxifragaceæ, § 1. Escalloniæ, DC. *Prodr.* 4. 2. (1830); *Endl. Gen.* p. 822.—Carpodetæ, Fenzl. in *Regensb. Denkschr.* iii. 155. t. 1.

DIAGNOSIS.—*Grossal Exogens*, with capsular fruit, axile placenta, definite style and stamens, and imbricated calyx.

Shrubs, with alternate, toothed, resinously glandular, exstipulate leaves, and axillary conspicuous flowers. Calyx superior, 5-toothed. Corolla consisting of 5 petals, alternate with the segments of the calyx, from within which they arise, sometimes forming by their cohesion a tube, but finally separating; aestivation imbricated. Stamens arising from the calyx, alternate with the petals; anthers bursting longitudinally. Disk conical, epigynous, plaited, surrounding the base of the style. Ovary inferior, 2-5-celled, with a large polyspermous placenta in the axis; style simple; stigma 2-5-lobed. Fruit capsular or baccate, surmounted by the persistent style and calyx. Seeds very numerous and minute, with a transparent membranous integument; embryo minute, in a mass of oily albumen, its radicle opposite the hilum.

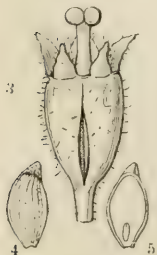
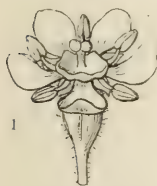


Fig. DI.

By De Candolle and others, these plants are either considered a section of Saxifrages, or are placed in the immediate vicinity of that Order; an opinion founded upon their polyspermous fruit, composed of two carpels, their polypetalous flowers with a small number of stamens, and some similarity in their habit as compared with Cunoniads, which are also often referred to Saxifrages. By other writers they are contrasted with Heathworts and Cranberries, and upon the whole they seem most closely akin to the latter of those Orders, of which they have also the habit, and almost the monopetalous corolla. A trace of resemblance to Melastomads may even be perceived in the remarkable cup-shaped epigynous disk of Escallonia. Brown, however, long since demonstrated the necessity of considering them closely allied to Currantworts, from which, indeed, they are hardly known, except by their oily albumen, dry fruit, and occasionally cohering petals; for some of them have almost parietal placenta, as Anopterus. Of that Order they must therefore of necessity follow the station. From Bruniads they are known, firstly, by their broad leaves, lax inflorescence and larger flowers; and secondly, by their many-seeded fruit. Indeed Bruniads may, in one point of view, be regarded

as a less developed form of Escalloniads.

It is said that *Escallonia canescens* has an embryo nearly as long as the albumen; this, if true, will be a great anomaly in the Order, and requires re-examination.

All found in the temperate parts of the world, especially South America. In countries near the equator belonging to the west side of America, Escalloniads grow at the considerable elevation of 6600 to 14,760 feet, and there, with Oaks and Drymids, they form a vegetable region. They are even found as far southward as the Straits of Magellan. A few species of the Order occur in the Isle of Bourbon, the Malay Islands, and the southern parts of Australia and New Zealand.

Their properties are unknown. All are shrubs, with evergreen leaves, which have often a powerful odour.

## GENERA.

*Escallonia*, Mutis.  
*Stercorarium*, R. et P.  
*Quintinia*, A. DC.

*Choristylis*, Harv.  
*Forgesia*, Comm.  
*Defforgia*, Lam.

*Itea*, L.  
*Diconangia*, Mitch.

*Cedrela*, Lour.  
*Carpodetus*, Forst.  
? *Pseuditea*, Hassk.

NUMBERS. GEN. 7. Sp. 60.

*Saxifragaceæ.*

POSITION.—*Grossulariaceæ.*—*ESCALLONIACEÆ.*—*Vacciniaceæ.*

*Bruniaceæ.*

Fig. DI.—*Escallonia pulverulenta*. 1. a flower. 2. a cross section of the ovary; 3. fruit; 4. seed; 5. its perpendicular section.



## ORDER CCLXXXIX. PHILADELPHACEÆ.

*Philadelphææ, Druce in J. E. Smith's Synonym. Phil. Acad. Nat. Hist. Phil., 1829, p. 104, tab. 10.*  
*Frax. Philadelphææ.*

DIAGNOSIS.—*Woody, Leaves with opposite veins, simple alternate, smooth, rarely 3-nerved, and pinnatifid.*

Shrubs. Leaves deciduous, opposite, toothed, without, smooth or serrated. Flowers axillary or terminal, in the leaf-axillary cymes. Flower white, or pink. Perianth-segments a little scurfy. Calyx adherent, with a persistent limb, having from 4 to 10 valvate divisions. Petals alternate with the segments of the calyx, and equal to them in number, with a convolute-imbricate aestivation. Stamens 00, arising in one or two rows from the orifice of the calyx. Styles either distinct or consolidated into one; stigmas several; ovules 00, attached to an axile placenta. Capsule half inferior, with from 4 to 10 cells, many-seeded. Seeds scabiform, subulate, smooth, heaped in the angles of the cells upon an angular placenta, with a loose membranous skin. Albumen fleshy; embryo about as long as the albumen; cotyledons oval, obtuse, flattish; radicle longer than the cotyledons, straight, obtuse, superior or inferior, next the hilum.

No doubt can exist that these plants have a near relation to Myrtelblooms, although they may not have such a resemblance as will justify their being stationed in the very same Alliance; for they correspond in their inferior fruit, opposite leaves, perianth-segments, and indefinite stamens. Some Botanists, however, because of their more agreeable fragrance, would rather refer them to Saxifragæ, with which, in fact, they do have a collateral relationship. They are, however, evidently a portion of the Geraniæ Alliance, standing nearly allied to Escalloniads. Among that Alliance they are closely connected by their valvate calyx, indefinite stamens, and disunited ovary. Moreover, many before seeds cut them off from Barringtoniads, and their axile placentæ, and a separate class from Currantworts.

The species are found sparingly in the south of Europe, North America, China, and India.

Little can be said of their uses. The rough bark of *Prunella spinosa* is much employed by polishers, and its inner bark for poultries. *Philadelphææ procumbens*, which flowers have a sweet but very peculiar smell, and whose leaves have like *Urtica dioica*, sometimes considered a tonic, and the oil of its flowers was used for softening oil of lavender.

## GENERA.

*Prunella*, Linn.  
*Saxifraga*, Thunb.  
*Diarrhoea*, Linn.  
*Geranium*, Linn.  
*Prunella*, Thunb.  
*Philadelphæa*, DC.

NUMERUS. Figs. 11, 12, 13.

*Myrtelblooms.*

POSITION.—GROSSALES.—PHILADELPHACEÆ.—*Myrtelblooms.*  
*Saxifragæ.*

FIG. 111. *Prunella spinosa*, Linn. 1. A branch with the flowers, 2. A single flower, 3. A single petal, 4. A single stamen, 5. A single pistil, 6. A single seed, 7. A single embryo, 8. A single cotyledon, 9. A single radicle, 10. A single capsule, 11. A single seedling, 12. A single seedling, 13. A single seedling.



## ORDER CCXC. BARRINGTONIACEÆ.—BARRINGTONIADS.

Myrtaceæ, § Barringtoniæ. DC. Prodr. 3. 288. (1828); Benth. Ord. Nat. 322. (1830).—Barringtoniæ, DC. Dict. Class. v. XI. not. (1826); Martius Conspectus, No. 319 (1835); Wight Illustr. 2. 19.

DIAGNOSIS.—*Grossal Exogens*, with pulpy or fibrous fruit, axile placentæ, 1 style, 00 stamens, and an imbricated calyx.

Trees or shrubs, with alternate, often serrated leaves, destitute of transparent dots.

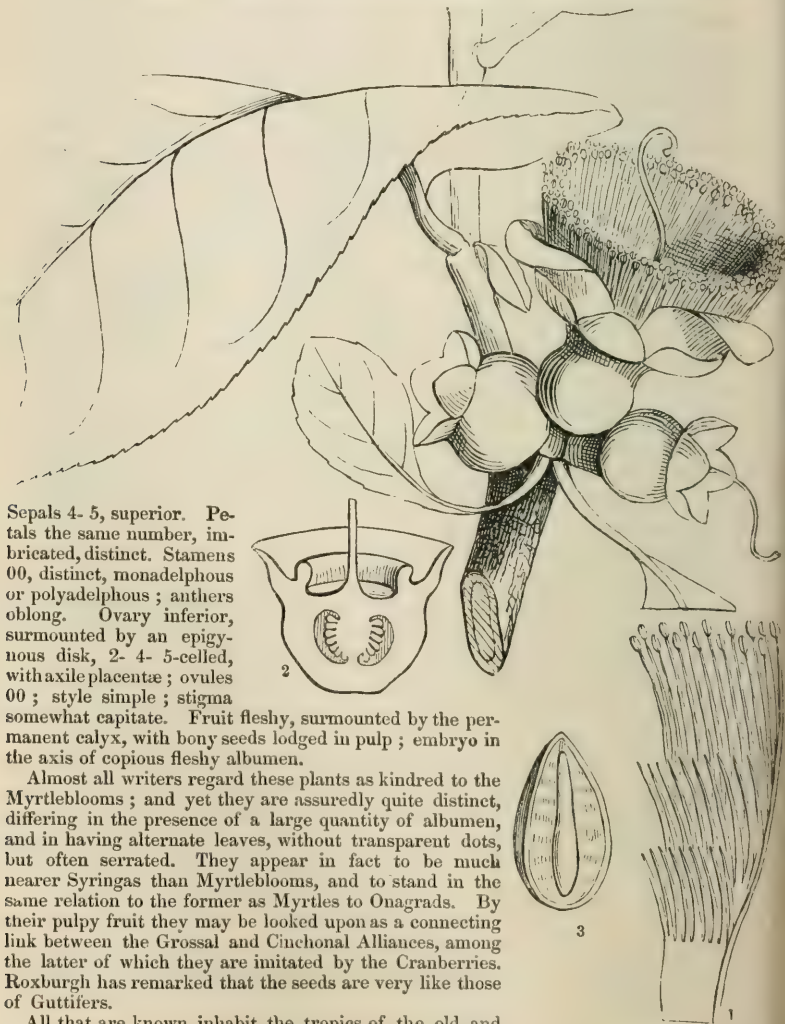


Fig. DIII.

Sepals 4- 5, superior. Petals the same number, imbricated, distinct. Stamens 00, distinct, monadelphous or polyadelphous; anthers oblong. Ovary inferior, surmounted by an epigynous disk, 2- 4- 5-celled, with axile placentæ; ovules 00; style simple; stigma somewhat capitate. Fruit fleshy, surmounted by the permanent calyx, with bony seeds lodged in pulp; embryo in the axis of copious fleshy albumen.

Almost all writers regard these plants as kindred to the Myrtleblooms; and yet they are assuredly quite distinct, differing in the presence of a large quantity of albumen, and in having alternate leaves, without transparent dots, but often serrated. They appear in fact to be much nearer Syringas than Myrtleblooms, and to stand in the same relation to the former as Myrtles to Onagrads. By their pulpy fruit they may be looked upon as a connecting link between the Grossal and Cinchonalliances, among the latter of which they are imitated by the Cranberries. Roxburgh has remarked that the seeds are very like those of Guttifers.

All that are known inhabit the tropics of the old and new world, some of them occurring in low moist ground.

The root of *Stravadium racemosum* has a slightly bitter but not unpleasant taste. It is considered by the Hindoo Doctors valuable on account of its aperient, deobstruent,

Fig. DIII.—*Careya arborea*. 1. one of the bundles of stamens; 2. a perpendicual section of the ovary; 3. section of the seed.—Wright.



and cooling qualities: the bark is supposed to possess properties similar to those of Cinchona. The wood of *Grossartia oreana* is called Rose wood, because it smells like roses, after exposure to the air, especially in cold. The effect upon the stomach produced by the fruit of *Grossartia oreana* is very singular. According to Humboldt and Bonpland, children are very fond of the fruit, and cannot spare before going to sleep; it, but in 24 to 48 hours they regain their natural course without any trouble. Martius states that the fruit of *Grossartia oreana* is very aromatic and stimulates well; the taste is acid, aromatic, and bitter; the leaves have a heavy unpleasant smell, which is not found in cases of indurated liver, and for forming silver salt, bark. Kuntze says that although the fruit of *Grossartia oreana* is eaten for the sweet appearance.

## GROSSARTIA

Barringtonia, Planch.	Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama
Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama
Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama
Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama
Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama	Barro Colorado, Panama

NUMBER OF SPECIES 10.

CLIMATE.

POSITION.—Lascaria, Mexico.—Barro Colorado, Panama.—Philippine Islands.

Barringtonia, Planch. in *Stuebel's*

For illustration of *Barringtonia oreana*, see *Atlas*, Plate I, III.



FIG. 1000.

FIG. 1001. *Barringtonia oreana*, Planch.



ALLIANCE LIV. *CINCHONALES*.—THE CINCHONAL ALLIANCE.

DIAGNOSIS.—*Epigynous Exogens, with dichlamydeous monopetalous flowers, and a minute embryo lying in a large quantity of albumen.*

This Alliance is known from Campanals and Myrtals by its large quantity of albumen and small embryo, from Cactals, Grossals, and Umbellals by its monopetalous corolla, from Asarals by its dichlamydeous flowers. The Orders of it are closely allied, the three last in the following enumeration being indeed separated by no very strong characters. Cranberries and Columelliads, although not usually brought up to this point, are, nevertheless, hardly separable from the Alliance; the former are a lateral tendency to Ericals.

Cinchonals are distinguishable from Umbellals by little except their monopetalous corolla, especially if Caprifolds and Cornels are compared, and therefore must participate in the undoubted affinity of the latter Alliance to Ranals; a circumstance not to be lightly esteemed in mapping out the position which the various groups of the Natural system occupy with respect to each other.

A very strong approach is shown to the diclinous sub-class, on the part of Caprifolds, among which Viburnum, minus a corolla and with an amentaceous inflorescence, would almost be a Garryad. Indeed, even a tendency to unisexuality occurs among Caprifolds, when, as in Viburnum, &c., some or all the flowers become neuter or male. And here again we have exactly the same tendency as manifests itself in so many genera of Umbellifers, which, as in Heracleum, &c., form radiant male or neuter flowers.

## NATURAL ORDERS OF CINCHONALS.

- |  |                       |
|--|-----------------------|
| <i>Stamens epigynous; anthers opening by pores . . . . .</i>           | 291. VACCINIACEÆ.     |
| <i>Stamens epipetalous, bursting longitudinally; anthers sinuous.</i>  | } 292. COLUMELLIACEÆ. |
| <i>Flowers unsymmetrical . . . . .</i>                                 |                       |
| <i>Stamens epipetalous, bursting longitudinally; anthers straight.</i> | } 293. CINCHONACEÆ.   |
| <i>Leaves with interpetiolar stipules . . . . .</i>                    |                       |
| <i>Stamens epipetalous, bursting longitudinally; anthers straight.</i> | } 294. CAPRIFOLIACEÆ. |
| <i>Fruit consolidated. Leaves without stipules . . . . .</i>           |                       |
| <i>Stamens epipetalous, bursting longitudinally; anthers straight.</i> | } 295. GALIACEÆ.      |
| <i>Fruit didymous. Leaves verticillate, without stipules . . . . .</i> |                       |



## ORDER CXXII. VACCINIACEÆ.—Eriobotryaceæ.

*Vaccinium*, *Do. Don. Bot. Ind. 1812* (Nat. Hist. p. 19) 200. *Winkl. 8. Ind.*

**DIAGNOSIS.**—*Cinchonellæ* *Leaves*, with epigynous anthers and anthers opening by pores.

Much branched shrubs or small trees, frequently evergreen, and commonly epiphytic. Leaves alternate, uncinclad, without stipules, often with glabrous venæ. Flowers solitary or in racemes. Calyx superior, entire, or with from 4 to 6 lobes. Corolla imbricated in aestivation, monopetalous, lobed as often as the calyx. Stamens distinct, double the number of the lobes of the corolla, inserted into an epigynous disk; anthers with 2 horns and 2 cells, bursting by pores. Ovary inferior, 4- to 10-celled; style simple; stigma simple. Berry or seed by the persistent limb of the calyx, succulent, 4- to 10-celled; cells 1- or many-seeded. Seeds minute, pendulous when solitary; embryo straight, in the axis of fleshy albumen; cotyledons very short; radicle lower, inferior.

It is usual to station these plants with Heathworts, to which they bear much resemblance, and of which they are no doubt the representative in the Epigynous Sub-class. They are, however, to all appearance closely allied to Cinchonaceæ in their monopetalous flowers, inferior ovary, and albuminous seeds, and also to Escalloniaceæ, which are chiefly known by being polyptalous. The want of adhesion between their stamens and corolla is analogous to what occurs among Columelliads. Myrtleblooms, with their dotted leaves and indefinite stamens, are very different; but they too sometimes

correspond in their anthers bursting by pores. Upon the whole *Vacciniaceæ* may be considered as an Order standing on the borders of the Epigynous and Oupigynous Sub-classes, and of the Cinchonæ and Grossal Alliances.

The species abound in the temperate parts of the world, especially in wooded and alpine countries. Some are from the mountains and southern of Europe, others from the mountains of central Asia, many from North America, and not a few from the highlands of Peru. Some of the Peruvian species are said to be poisonous.

They are chiefly known as garden shrubs. Their fruit and leaves are supposed slightly tonic and stimulating; their berries saturated and pleasant to the taste. The berries are the fruit of *Vaccinium Myrtillus*, *W. and A.* of *V. uliginosum*, *Mill.* berries of *V. vitis idæa* and the *Oxycoccus palustris* and *macrocarpa*. Many *Vaccinium* species are substitutes for them. The juice of *Plant. Ind. Ind. Ind.* from the fruit of *Thibaudia macrophylla*; that of our *Vaccinium uliginosum* is said to be superior, and to be sometimes put into beer and other liquors to give them body, as when fermented it yields an intoxicating liquor. From the flowers of *Thibaudia* *Spencer* and *peruviana* tincture is prepared in Peru as a remedy for febrile affections.



Fig. 14V. *Vaccinium myrtillus*. 1. a flower; 2. a longitudinal section of the ovary; 3. a cross section of an ovary; 4. an anther; 5. a seed.



## GENERA.

Gaylussacia, <i>H. B. K.</i>	<i>Vitis Idæa</i> , Tournef.	<i>Choupalon</i> , Adans.	<i>Oreanthes</i> , <i>Benth.</i>
<i>Lussacia</i> , Spreng	? <i>Adenaria</i> , Raf.	<i>Symphysia</i> , Presl.	<i>Cavendishia</i> , <i>Lindl.</i>
<i>Sphyrospermum</i> , <i>Pöpp. et Endl.</i>	<i>Decachæna</i> , <i>Torr. et Gr.</i>	<i>Tauschia</i> , Presl.	<i>Macleania</i> , <i>Hook.</i>
<i>Oxycoccus</i> , <i>Tournef.</i>	<i>Thibaudia</i> , <i>Pav.</i>	<i>Andrewsia</i> , <i>Dunal.</i>	<i>Anthopterus</i> , <i>Hook.</i>
<i>Schollera</i> , <i>Roth.</i>	<i>Agapetes</i> , <i>Don.</i>	<i>Peyrusa</i> , <i>Rich.</i>	? <i>Brossæa</i> , <i>Plum.</i>
<i>Vaccinium</i> , <i>Linn.</i>	<i>Cavinium</i> , <i>Thouars.</i>	<i>Hornemannia</i> , <i>Vald.</i>	? <i>Amechania</i> , <i>DC.</i>
	? <i>Acosta</i> , <i>Lour.</i>	<i>Ceratostema</i> , <i>Juss.</i>	

NUMBERS GEN. 13. Sp. 200.

*Ericaceæ.*POSITION.—*Cinchonaceæ.*—VACCINIACEÆ.—*Columelliaceæ.**Escalloniaceæ.*

In a paper in the *Linnaea* for 1851, Dr. Klotzsch has altered very needlessly the name of this Order to SIPHONANDRACEÆ, combining with it a part of *Ericaceæ*, and has proposed the following

## ADDITIONAL GENERA.

<i>Tyria</i> , <i>K.</i>	<i>Siphonandra</i> , <i>K.</i>	<i>Sophoclesia</i> , <i>K.</i>	<i>Psammisia</i> , <i>K.</i>
<i>Satyria</i> , <i>K.</i>	<i>Semiramisia</i> , <i>K.</i>	<i>Polyboea</i> , <i>K.</i>	<i>Pentapterygium</i> , <i>K.</i>
<i>Socratesia</i> , <i>K.</i>	<i>Eurygania</i> , <i>K.</i>	<i>Proclesia</i> , <i>K.</i>	<i>Epigynium</i> , <i>K.</i>
<i>Orthæa</i> , <i>K.</i>	<i>Caligula</i> , <i>K.</i>	<i>Themistoclesia</i> , <i>K.</i>	<i>Phalerocephalus</i> , <i>G. Don.</i>

He also refers *Amechania* to his *Arbutææ*.



## ORDER CCXCII. COLUMELLIACEÆ I.—COLUMELLIACEÆ.

*Columellia*, Don, in *Etude sur l'Ordre des Plantes de l'Asie et de l'Australie*, 28. p. 1. (1828).  
*Etude sur l'Ordre des Plantes de l'Asie et de l'Australie*, 28. p. 1. (1828).

DIAGNOSIS.—*Cinchonoid* flowering, with epipetalous stamens, subequal fleshy sepals, longitudinal, and longitudinal flowers.

Evergreen shrubs, or trees. Leaves opposite, without stipules, entire or serrated. Flowers yellow, terminal. Calyx subequal, 5-lobed. Corolla tubular, 5-lobed, with an imbricated aestivation.

Stamens 2, inserted in the throat, alternate with the segments of the corolla; anthers roundish, 3-lobed, bursting externally, each consisting of three pairs of narrow, somewhat sinuous cells, which open longitudinally, and which are placed upon a solid fleshy connective. Ovary inferior, 2-celled, with an indefinite number of ovules; style simple, smooth; stigma capitate, 2-lobed. Disk epigynous, fleshy. Fruit capsular, 2-celled, many-seeded, with both septicidal and loculicidal dehiscence; testa polished; embryo taper, erect, in the axis of fleshy albumen, with oval obtuse cotyledons, and a taper radicle longer than the cotyledons.

The late Professor Don, who first noticed this Order, thinks it near Jasmynes, with which it corresponds "in the structure and aestivation of the corolla, in the bilocular ovary, and erect (?) ovules; and it agrees both with them and *Syringa* in the structure and dehiscence of the capsule. The Order differs, however, essentially from *Jasmineworts*, by having an adherent ovary, by the presence of a perigynous (?) disk, by the undivided stigma, and, lastly, by having an inferior capsule with polyspermous cells." He was probably led to this notion by having included in his *Columelliads* the genus *Mimodora*, which is a genuine member of the *Jasminaceous* Order. He also supposed that

an affinity could be traced with *Halesia*, and *Callistegia*, which agree that *Myrsine* has placed the genus as an anomalous member of *Rubiacæ*. *Mimodora* is a plant of the view. But it is very clear that none of the Orders thus referred to can be in the neighbourhood of *Columellia*, which may be almost described as a *Myrsinaceous* *Onagrad*. Its indefinite seeds are entirely at variance with all the members of *Ebenads* and *Jasmineworts*, to say nothing of its inferior seeds. At the same time it is impossible to say where it really ought to stand, for there seems no great similarity between *Columellia*, &c., and any other Order yet described. In this connection I leave it by the side of *Cranberries* and *Cinchonads* to attend of which, and especially to the latter, it may be compared. The most striking feature in its structure is its stamens; these curious bodies, rarely represented in the *Flora*, *Myrsinæ*, are apparently composed each of three stamens firmly consolidated; the whole being thus 6 cells arranged in 3 pairs upon a lobed fleshy connective, and seated beneath the corolla. Now this indicates an irregularity of structure of a most unusual kind, and to which I find no parallel; in order to convey such a structure to propriety, the



FIG. IV.



must either suppose that three more such triple stamens are abortive, and that consequently the typical number of parts in the andrœceum is 25, or we must imagine that the typical number is 10, and that each of the stamens actually developed is composed of two stamens opposite the segments of the corolla, and one alternate with them; in that case three of the stamens alternating with the lobes of the corolla, and two of those opposite the lobes will have to be supposed undeveloped. This would give us a pentamerous monopetalous flower, with twice as many stamens as parts of the corolla. Endlicher adopts this view so far as admitting the existence of three anthers to each stamen.

The species hitherto discovered are from Mexico and Peru.

They are not stated to possess any useful properties.

#### GENUS.

*Columellia*, R. P.

*Uluxia*, Juss.

NUMBERS. GEN. 1. Sp. 3.

*Onagraceæ*.

POSITION.—*Vacciniaceæ*.—COLUMELLIACEÆ.—*Cinchonaceæ*.



## Diam. CUNCH CINCHINACILR-Compound

[illegible]

DIAGNOSIS.—*Cyathochaeta* *Flammula*, with irregularly imbricated, blackish, rather shining, and minutely, and linearly serrated margins.

Trees, shrubs, or herbs. Leaves simple, opposite, sessile or petioled, with interpeduncular stipules. Flowers axillary, usually, usually in panicles or racemes. Calyx adherent, with a definite number of divisions, or none. Corolla superior, tubular, regular, with a definite number of divisions, which are valvate or imbricated in aestivation and equal to the segments of the calyx. Stamens arising from the corolla, all on the same line, and alternate with its segments. Ovary inferior, surmounted by a disk, usually 2-celled, occasionally with several cells; ovules numerous and attached to a central placenta, or few and erect or ascending, anatropal or amphitropal; style single, inserted, sometimes partly divided; stigma usually simple, sometimes divided into a definite number of parts. Fruit inferior, either splitting into 2 cocci, or indehiscent and dry or succulent, occasionally many-celled. Seeds definite

or indefinite; in the former case erect or ascending, in the latter decumbent or a horizontal axis; embryo small, oblong, orthotropal or homotropal, surrounded by two cotyledons; cotyledons thin; radicle longer, inferior.

This well-marked and strictly limited Order is distinguished from all others by its long slender, cylindrical, and very slender corolla, which its distinct anthers, bilocular or plurilocular ovary, and distinct embryo, and stipules distinguish it; and especially by its possession of that extensive Order. The relations of the present Order to that of Composites; and in the genus *Argemone*, will be the subject of a future publication. No doubt then can be entertained that the Compositae and Umbelliferae will come in contact at one part of their frontier. This is however a very curious genus of the present Order, called *Oxyechia*, and is distinguished by but one cell in its ovary and one seed, and the number of stamens equal to that of the corolla: it occupies an intermediate position between the present Order and Teazelworts. There is also, notwithstanding the very great difference in the present Order, the closest resemblance to Umbelliferae, namely, in the genus *Paderia* and *Lyedysolia*, which scarcely differ from the Umbelliferae in their

Fig. DV1. Coffea arabica. Fig. 2 shows a scanning electron micrograph of a surface of a seed, showing the small structure that occurs on the surface during growth.



to a bifid thread-shaped torus, very much as in Umbellifers themselves. Loganiads (p. 602) may be regarded as Cinchonads with a free ovary. There is nothing to distinguish this Order from the Caprifoliaceae except the stipules, and even this mark occasionally fails us. For example, in *Symphoria racemosa* the strong shoots are occasionally furnished with interpetiolar stipules, and of large size; an instance of which is now before me. Some of the genera have the peculiarity of forming one of the sepals in the thin, large, and gaily-coloured condition of a petal, as occurs in the genera *Mussaenda* and *Calycophyllum*. Sir R. Schomburgk states that in a very fine species of the latter genus, found by him in British Guayana, the growth of this petaline sepal is very rapid, expanding to its natural size in the course of a couple of days, and only forming itself after the flower (corolla) has dropped off.—*Lond. Journ. Bot.* 3. 623.

Cinchonads are almost exclusively found in the hotter parts of the world, especially within the tropics, where they are said to constitute about 1-29th of the whole number of flowering plants. In America the most northern species is *Pinckneya pubens*, a shrub inhabiting the southern states of North America; some *Coprosma*s also occupy very low southern latitudes; the most southern is *Nerteria depressa*, a small herb found in the Straits of Magellan. The Order is represented in northern regions by *Stellates*.

This Order is not only one of the largest of which we have knowledge, but also contains a very considerable number of important species, largely employed for the use of man in the countries they inhabit. Many are among the most valuable of all remedial agents, acting as tonics, febrifuges, emetics, or purgatives. Others, on the contrary, having their secretions in a state of great concentration, prove to be formidable poisons; nevertheless, a few produce eatable fruit, and one is celebrated over all others for its agreeable stimulating seeds. Dyeing qualities are also observed in a small number. The reader who desires to occupy himself with the detailed study of the uses of this extensive Order will consult Geiger's *Handbuch*, Dierbach's *Arzneikräfte*, Endlicher's *Enchiridion*, the *Flora Medica*, and the works on *Materia Medica* by the two Martiuses, Fée, Guibourt, Pereira, Nees v. Esenbeck, Ebermaier, &c. A few of the principal examples are all that need be mentioned in this place.

Foremost among febrifuges and tonics stand the various Peruvian species of *Cinchona*, of which *C. micrantha* and *Condaminea* are the best. To these succeed the *Remijas* of Brazil, which are in that country species of great importance. Buena hexandra bark is an indifferent febrifuge, known in Brazil under the name of China. The bark of French Guiana, possessing properties analogous to those of *Cinchona*, is obtained from *Portlandia hexandra*, the *Coutarea speciosa* of Aublet. The *Quinquina Piton* and *Quinquina des Antilles* are produced by species of the genus *Exostema*, and are remarkable for possessing properties similar to those of true *Quinquina*, but without any trace of either cinchonine or quinine. A kind of fever bark is obtained at Sierra Leone from *Rondeletia febrifuga*. Besides these, a great number of other species possess barks more or less valuable: *Pinckneya pubens* is the fever bark of Carolina; *Condaminea corymbosa*, *Guettarda coccinea*, *Antirhea*, and *Morinda Roycei*, are all of the same description. Of *Hymenodictyon excelsum*, an East Indian shrub, the inner bark possesses the bitterness and astringency of Peruvian bark, and when fresh in a stronger degree. The bitterness is not so quickly communicated to the taste, on chewing the bark, but is much more durable, especially about the upper part of the fauces. *Ophiorhiza Mungos* is so intensely bitter that the plant is called by the Malays Earth-gall; according to Kämpfer, the taste resembles *Gentian*, but is more penetrating. The root and bark of *Guettarda Angelica* are aromatic and acrid, and are used as febrifuges and astringents in the veterinary practice of Brazil.

As simple astringents the most remarkable is the *Uncaria Gambir*. An extract called Gambier is prepared by the Malays from the leaves of this shrub; with some sweetness, it has a more astringent taste than *Terra Japonica*. Roxburgh considered it one of the drugs, if not the only one, formerly called by that name in Europe. The extract is chewed by the natives with Betel-leaf and Areca; the leaves are chewed to relieve aphthous eruptions of the mouth and fauces. Mr. Pereira considers this Gambier not to form any of the Kinos of the shops, but to be one of the substances called Catechu in commerce. The root and bark of *Antirhea verticillata* are said to be powerfully astringent. In Bourbon it is employed as a styptic to restrain hæmorrhage, and is known by the name of Bois de Losteau. A decoction of the leaves as well as root of *Canthium parviflorum* is prescribed in India in certain stages of flux, and the last is supposed to have anthelmintic qualities, though neither have much sensible taste or smell. The bark and young shoots are also used in dysentery.

Among the purgatives or emetics, *Ipecacuanha* holds the first rank; it is the root of *Cephaelis Ipecacuanha*, a little creeping-rooted, half-herbaceous plant, found in damp shady forests in Brazil. It is also sudorific and expectorant. Its powder acts upon the



respiratory passages as an irritant, producing spasmodic action. The mere odour of the root seems sufficient to excite difficulty of breathing and suffocation. Similar properties are found in the root of *Polypodium* country, as in *Richardsonia toona* and *Scilla*, *Ornithoglossum*, *Dasycodon ferruginea* and *Porrea*, &c. The Root of *Polypodium* is used in curing dropsy, and in destroying the dangerous effects of the



1001

[illegible]

It may easily be supposed that secretions prepared by plants for the purpose described would, if a little modified or augmented in their composition, be accordingly we find several species of *Cimicifuga* used in the same way as the agents. Sir R. Schomburgk assures us that Indians take bark prepared by boiling the wood of *Evosmia corymbosa* to make ships fire-proof. *Wood's* *Medicinal Plants*, p. 219. According to Roxburgh, the root of *Ranunculus* (some say *R. repens*) used in ponds where there are fish, intoxicates them like *Cimicifuga* Indians. *Thesaurus Zeylanicus*, p. 109. *Palicourea Maregraavii*, both called *Erva de rato*, are used to kill rats in the fields where they and other species of the same genus are applied for the same purpose against rats and mice. *Cephaelis ruelliaefolia* is verminous, and used for the same purpose.

Fig. DVI.★—Richardsonia seedling. Leaves agree with the description of a seedling, bearing on a seed, with an erect embryo in copious albumen.



An eatable fruit is furnished by a few species. The Genipap, a South American fruit as large as an Orange, of a whitish-green colour, but containing a dark purple juice with an agreeable vinous taste, is borne by *Genipa americana*. *Sarcocephalus esculentus* is the Native Peach of Sierra Leone. *Vangueria edulis*, or Voa-vanga, is said to be a good dessert fruit in Madagascar. *Genipa brasiliensis* is also eaten in Brazil, but Martius says that it is only fit for table after becoming blebbed, and that it is better when preserved with sugar than when fresh. Some of the bushes called in Tasmanian Native Currants are *Coprosma*; but they are not of good quality.

Coffee is the roasted seeds of a plant of this Order, *Coffea arabica*, and is supposed to owe its stimulating, refreshing characters to a peculiar chemical principle called Caffein, which modern chemists pronounce to be the same as Theine. The part roasted is the albumen, which is of a hard horny consistence; and it is probable that the seed of other plants of this or the stellate Order, whose albumen is of the same texture, would serve as a substitute. This would not be the case with those with fleshy albumen.

Among dyeing plants we have *Oldenlandia umbellata*; whose roots are a substitute for Madder in the East Indies; *Psychotria Simira*, whose bark stains red in Brazil; *Genipa brasiliensis*, whose fruit strikes a deep violet; *Condaminea tinctoria*, *Hydrophylax maritima*, various species of *Morinda*, and others of less consequence.

The fragrance or beauty of the flowers of some of the plants of this Order, especially of the *Gardenias*, *Hindsias*, *Posoquerias*, *Ixoras*, *Cinchonas*, *Bouvardias*, *Catesbæas*, &c. is unsurpassed in the vegetable kingdom, and forms a strange contrast with the *Spermacoces*, *Richardsonias*, &c., which are among the meanest weeds we know.

### GENERA.

I. COFFEEÆ. — Ovary with only 1 or 2 seeds in each cell.	<i>Mitracarpum</i> , Zuccar. <i>Schizangium</i> , Bartl. <i>Staurospermum</i> , Thon.	<i>Suteria</i> , DC. <i>Coffea</i> , Linn. <i>Hornia</i> , DC. <i>Pancrasia</i> , DC.	<i>Roussia</i> , Dennst. <i>Lecointea</i> , A. Rich. <i>Lygodysodea</i> , R. et Pav. <i>Disodea</i> , Pers.
I. OPERCULARIDÆ.  Pomax, Soland. Opercularia, A. Rich. <i>Cryptospermum</i> , Yng.	Perama, Aubl. <i>Mattuschkea</i> , Schreb. <i>Staelia</i> , Cham. Tessiera, DC. <i>Psyllocarpus</i> , Mart. <i>Diodora</i> , Pohl.	<i>Straussia</i> , DC. <i>Strempelia</i> , A. Rich. <i>Faramaea</i> , A. Rich. <i>Tetramerium</i> , DC. <i>Potima</i> , Pers. <i>Darluca</i> , Rafin. <i>Antoniana</i> , Tuss.	VI. GUETTARDIDÆ.  <i>Morinda</i> , Vaill. <i>Chrysorhiza</i> , DC.
II. ANTHOSPERMIDÆ.  <i>Anthospermum</i> , Linn. <i>Ambraria</i> , Heist. ? <i>Crocylis</i> , E. Mey. ? <i>Lagotis</i> , E. Mey. <i>Ambraria</i> , Cruse. <i>Nenax</i> , Gärtn. <i>Galopina</i> , Thunb. <i>Oxyspermum</i> , Eckl. <i>Phyllis</i> , L. <i>Coprosma</i> , Forst. <i>Leptostigma</i> , Arn.	<i>Gaillonia</i> , A. Rich. <i>Ptychostigma</i> , Hochst. <i>Otiophora</i> , Zuccar. <i>Knoxia</i> , Linn. <i>Jaubertia</i> , Guillem. <i>Machaonia</i> , Humb. <i>Emmeorhiza</i> , Pohl. <i>Endlicheria</i> , Presl. <i>Deppea</i> , Cham. et Schl. <i>Cruickshanksia</i> , H. et Arn. <i>Rotheria</i> , Meyen. <i>Cephalanthus</i> , L.	<i>Macrocalyx</i> , Miers. <i>Rytidea</i> , DC. <i>Grumilea</i> , Gärtn. <i>Polyosus</i> , Lour. <i>Coussarea</i> , Aubl. <i>Billardiera</i> , Vahl. <i>Frölichia</i> , Vahl. <i>Saprosma</i> , Blume. <i>Pavetta</i> , L. <i>Ixora</i> , L. <i>Baconia</i> , DC. <i>Verulamia</i> , DC. <i>Chomelia</i> , Jacq. <i>Scolosanthus</i> , Vahl. <i>Antacanthus</i> , L.C. Rich. <i>Saldinia</i> , A. Rich. <i>Margaris</i> , DC. <i>Chiococca</i> , P. Br. <i>Tertrea</i> , DC. <i>Schiedea</i> , A. Rich. <i>Declieuxia</i> , H. B. K. <i>Psyllocarpus</i> , Pohl.	<i>Myrmecodia</i> , Jacq. <i>Hydnophytum</i> , Jacq. <i>Hypobathrum</i> , Blume. <i>Nertera</i> , Banks. <i>Gomezia</i> , Mutis. <i>Erythrodanum</i> , Thou. <i>Mitchella</i> , L. <i>Chamædaphne</i> , Mitch. <i>Baumannia</i> , DC. <i>Mephitidia</i> , Reinw. <i>Lasianthus</i> , Jacq. <i>Vangueria</i> , Commers. <i>Vanguiera</i> , Pers. <i>Vavanga</i> , Rohr. <i>Meyenia</i> , Lk. <i>Guettarda</i> , Vent. <i>Cadamba</i> , Sonner. <i>Halesia</i> , P. Br. <i>Dicrobotryon</i> , Willd. <i>Laugeria</i> , Jacq. <i>Ullobus</i> , DC. <i>Viviania</i> , Rafin.
III. SPERMACOCIDÆ.  <i>Putoria</i> , Pers. <i>Plocama</i> , Ait. <i>Placoma</i> , Pers. <i>Bartlingia</i> , Rehb. <i>Scyphiphora</i> , Gärtn. fil. <i>Hydrophylax</i> , Linn. fil. <i>Sarissus</i> , Gärtn. <i>Cuncea</i> , Hamilt. <i>Ernodea</i> , Sw. <i>Wiegmannia</i> , Meyen. <i>Serissa</i> , Commers. <i>Dysoda</i> , Lour. <i>Buchozia</i> , Herit. <i>Democritea</i> , DC. <i>Octodon</i> , Thonn. <i>Borreria</i> , Mey. <i>Bigelovia</i> , Spr. <i>Chlorophyllum</i> , Pohl. <i>Spermacoe</i> , Linn. <i>Hexasepalum</i> , Bartl. <i>Diodia</i> , L. <i>Triodon</i> , DC. <i>Crusea</i> , Cham. et Schl. <i>Pentania</i> , Harv. <i>Diolocarpus</i> , Hochst. <i>Richardsonia</i> , Kunth. <i>Richardia</i> , Linn. <i>Schiedea</i> , Bartl.	IV. PSYCHOTRIDÆ.  <i>Geophila</i> , Don. <i>Cephaelis</i> , Sw. <i>Callicocca</i> , Schreb. <i>Ipecacuanha</i> , Arruda. <i>Tapogomea</i> , Juss. <i>Callicocca</i> , DC. <i>Evea</i> , Aubl. <i>Carapichea</i> , Aubl. <i>Patabea</i> , Aubl. <i>Salzmannia</i> , DC. <i>Chasalia</i> , Commers. <i>Palicourea</i> , Aubl. <i>Galvania</i> , Vandell. <i>Stephanium</i> , Schreb. <i>Colladonia</i> , Spr. <i>Psychotria</i> , L. <i>Psychotrophum</i> , P. Br. <i>Myrtiphyllum</i> , P. Br. <i>Ronabea</i> , Aubl. <i>Viscoides</i> , Jacq. <i>Mapouria</i> , A. Rich. <i>Mapouria</i> , Aubl. <i>Simira</i> , Aubl. <i>Antherura</i> , Lour. <i>Rudgea</i> , Salisb. <i>Feretia</i> , Del. <i>Galiniera</i> , Del. <i>Codonocalyx</i> , Miers.	<i>Declieuxia</i> , H. B. K. <i>Eumachia</i> , DC. <i>Siderodendron</i> , Schreb. <i>Nescidia</i> , A. Rich. <i>Plectronia</i> , Linn. ? <i>Mitrostigma</i> , Harv. <i>Psilostoma</i> , Klotzsch. <i>Canthium</i> , L. <i>Psychraz</i> , Gärtn. ? <i>Krausia</i> , Harv. <i>Mitrostigma</i> , Hochst. <i>Diplospora</i> , DC. <i>Marquisia</i> , A. Rich. <i>Damnacanthus</i> , Gärtn. fil. <i>Amaracarpus</i> , Blume.	<i>Malanea</i> , Aubl. <i>Cunninghamia</i> , Schreb. <i>Antirrhæa</i> , Commers. ? <i>Neuropora</i> , Commers. <i>Stenostomum</i> , Gärtn. fil. <i>Sturmia</i> , Gärtn. <i>Stenostemum</i> , Juss. <i>Sacconia</i> , Endl. <i>Crusea</i> , A. Rich. <i>Chione</i> , DC. <i>Timonius</i> , Rumph. <i>Boba</i> , Gaudich. <i>Burneya</i> , Cham. <i>Erithalis</i> , Forst. <i>Eupyrena</i> , Wgt. et Arn. <i>Pyrostria</i> , Roxb. <i>Santia</i> , Wight et Arn. <i>Psathyra</i> , Commers. <i>Chicoinea</i> , Commers. <i>Hamiltontia</i> , Roxb. <i>Spermadietyon</i> , Roxb.
		V. PÆDERIDÆ.  <i>Pæderia</i> , L.	



[illegible]

## Neurophysiology

POSITION.—Galilee. — 4 m. N. of Nazareth.

\* These changes in the position of the organ were probably the consequence of the 20% increase in June, 1840.



For the distinctions and relative values of the Official Quinquinas, see Mr. Weddell's very important *Histoire Naturelle des Quinquinas* (folio, Paris, 1849). The following remarks by Mr. Bentham show that the systematical arrangement of the Order is at present far from being definitively settled:—

“Its tribes, as successively proposed by De Candolle, Jussieu, and A. Richard, and finally adopted in the *Prodrômus*, are generally easy of determination, but in some of the details perhaps too artificial, and a few slight changes and transpositions might render them more conformable to nature, without interfering with their practical utility. Too much reliance has, perhaps, been placed on the number of carpellary parts, and not enough on placentation (insertion of ovules), which, with the æstivation of the corolla, might in many instances better serve both for the definition and for the grouping of genera. The Naucleæ, well marked by their inflorescence and seeds, form an excellent tribe, if made to include Sarcoccephalus, Anthoccephalus, and Cephalanthus. In the Cinchonææ there is little to alter, although the line of demarcation between them and the Rondeletieæ is at present very ill-defined. The remainder of the many-ovuled tribes require some re-arrangement. The two-celled genera often present a third cell, and the many-celled are not unfrequently reduced to two. Gardenia itself has not the characters assigned to the tribe to which it gives its name, and the hardening of the endocarp, which distinguishes the polypyrænos from the multilocular berry, is but a vague character. It might be better to suppress the two last tribes (Isertieæ and Hamelieæ), and re-distribute the whole into three: Gardenieæ, with fleshy indehiscent fruits; Rondeletieæ, with dehiscent or plurilococous fruits and interpetiolar stipules; and Hedyoteæ, with dehiscent or plurilococous fruits and competiolar stipules. For the sub-division of Gardenieæ, the placentation appears to afford good characters, although I have not as yet examined with this view the whole of the genera. Probably three distinct forms will be found: Eugardenieæ, with parietal placentæ not reaching the axis; Randieæ, with the ovules more or less immersed in thick fleshy placentæ; and Bertiereæ (or say Hamelieæ?), with thinner placentæ, superficial ovules, and little or no pulp to the berry. Some genera of the last group come into close connexion with some Rondeletieæ, and from the latter the passage is very gradual into Hedyoteæ; yet I am unable to suggest any better distinction between them than those generally adopted. Of the tribe Isertieæ, *DC.*, *Metabolos* would take its place among Hedyoteæ, next to *Hedyotis* (*Euhedyotis*, *Arn.*), from which it differs but slightly as a genus; *Gonzalea* among Rondeletieæ, close to *Lerchea*; *Isertia* and *Bruinsmannia* among Gardenieæ (*Bertiereæ*). The greater part of the Hamelieæ would also range in the last-mentioned sub-tribe; for which, on that account, the name Hamelieæ might be retained. *Morelia*, however, as well as *Alibertia*, *Schradera*, and perhaps one or two more, would be classed in the sub-tribe Randieæ. To the same sub-tribe I should refer *Cordia*, and a few imperfectly-known genera allied to it, in which the ovules are said to be large, fleshy, and peltate, but which have most probably large fleshy peltate placentæ, with one or more ovules immersed therein, but not easily distinguishable in dried specimens. Among the solitary-ovulated tribes, the only alteration of importance which suggests itself is the consolidation of the two tribes of Guettardieæ and Coffeæ into one, as neither the two or many-celled ovary, nor the drupaceous or baccate fruit, appear to be sufficiently absolute distinctions to separate them as tribes. The whole might take the name of Coffeæ, and be divided into four or five sub-tribes, chiefly according to the æstivation of the corolla and insertion of the ovules, viz.:—*Vanguerieæ* (including *Morindeæ* and *Canthium*), with a valvate æstivation and pendulous ovules; *Psychotrieæ* (including *Cephaëlidaeæ*), with a valvate æstivation and erect ovules. Possibly a fifth might be inserted between *Guettardieæ* and *Ixoreæ*, with an imbricate æstivation, like in those two tribes, but differing from *Guettardieæ* in the baccate, not drupaceous fruit, and from *Ixoreæ* in the ovules suspended from the apex, or nearly so; but I am not acquainted with the fruits of a sufficient number of species of *Chomelia*, *Chiococca*, *Kraussia*, &c., to ascertain whether they can be really so separated from *Guettardieæ* even as a sub-tribe. I am doubtful also whether the few genera with an imbricate æstivation, and ovules erect or ascending, should be reckoned among *Ixoreæ*, or form an intermediate sub-tribe between them and *Psychotrieæ*. They are chiefly South American, and require further examination.”—(*Niger Flora*.)

## ADDITIONAL GENERA.

## ANTHOSPERMIDÆ.

*Dysodidendron*, *Gardn.*

## SPERMACOCIDÆ.

*Wigmannia*, *Meyen*, near *Putoria*.  
*Diphragmus*, *Presl*.

*Hypodematium*, *Rich.* near *Mitracarpum*.

## PSYCHOTRIDÆ.

*Proscaphaleium*, *Krthls.* near *Cephaëlis*.  
*Zwardekronia*, *Krthls.* } near *Psychotria*.  
*Streblota*, *Krthls.* }



Knoxiella, E. M.  
Crematospora, B. Th.  
Eriocopa, P. S.  
Pachysanthus, P. S.  
Tribaccha, K. Th.  
Remella, K. Th.  
Cleistocatera, K. Th., near A. M. S. P.

(1)  $\chi_{1,1} \times 11 \times 1$ 

Sphaerophora, *Bl.* near *M. ...*  
 Rytigynia, *Bl.* near *Con ...*  
 Lachnospoma, *Kittl.* near *Th ...*  
 Craterspermium, *Boett.* near *V ...*

## HAMELIDAE

Axanthos,	1	Unpublished
Cynelocema, <i>Piss.</i>	1	
Axanthopsis, <i>Keths.</i>	1	
Paraxinia, <i>Keths.</i>	1	near Unpublished

## L. S. K. 119.4.

*Brachistomella* *M. n.* near Isotry.

## 1111001101

Pentodon, *Houtst.*  
 Dictyospora, *Racib.*  
 Cryptophyllum, *Kütz.*  
 Vignoldia, *A. Rich.*  
 Phaeodes, *A. Rich.*  
 Ootomezia, *Benth.*



## ORDER CCXCIV. CAPRIFOLIACEÆ.—CAPRIFOILS.

*Caprifolia*, Juss. Gen. 210. 1799 *in part*.—Caprifoliaceæ, Rich. Dict. Class. 3. 172; DC. Prodr. 4. 321; Bartl. Ord. Nat. 213. (1830).—Lonicereæ, Endl. Gen. cxxviii.

DIAGNOSIS.—*Cinchonal Exogens*, with epipetalous stamens, straight anthers bursting longitudinally, consolidated fruit, and leaves without stipules.

Shrubs or herbaceous plants, with opposite leaves, destitute of stipules. Flowers usually corymbose, and often sweet-scented. Calyx superior, 4-5-cleft, usually with 2



Fig. DVII.

or more bracts at its base. Corolla superior, monopetalous or polypetalous, rotate or tubular, regular or irregular. Stamens epipetalous, equal in number to the lobes of the corolla, and alternate with them. Ovary with from 1 to 5 cells, one of which is often 1-seeded, the others being many-seeded; in the former the ovule is pendulous; style 1; stigmas 3, or 5. Fruit indehiscent, 1- or more-celled, either dry, fleshy, or succulent, crowned by the persistent lobes of the calyx. Seeds either solitary and pendulous, or numerous and attached to the axis; testa often bony; embryo very small, in fleshy albumen; radicle next the hilum.

As left by Jussieu this Order was a heterogeneous assemblage; as altered and better limited it seems to be less objectionable. It possesses a striking affinity with Cincho-

Fig. DVII.—*Sambucus nigra*; 1. a flower: 2. a young pistil; 3. a cross section of its ovary; 4. a perpendicular section of the fruit.



mads, in the monopetalous tubular corolla-  
 leaves, an affinity which is confirmed  
 by the corolla of the latter being occa-  
 sionally regular or irregular. To test  
 the resemblance between them in  
 habit, structure, inflorescence, and  
 sensible properties is so great that  
 there seems to be no certain character  
 to distinguish them except the stipules  
 of *Cinchonels*; for the character de-  
 rived from the presence of one ovule  
 only in one cell, and of many ovules in  
 two other cells, although very striking  
 in *Linnaea* and *Abelia*, disappears in  
 others, especially in *Leysisteria*, whose  
 ovary has 5 polyspermous cells; and  
 yet that genus cannot be possibly se-  
 parated from *Caprifoliis*. Their epi-  
 gynous structure divides them from  
*Dogbanes*, which have much resem-  
 blance in habit: *Loranthis*, once mixed  
 with them, have no petals. But if we  
 consider the Sub-order called *Sambu-  
 cere*, our view of the affinities of the  
 Order takes a different turn, and we  
 find an approach to *Saxifragals*: this is  
 established through the intermediate of  
*Ulmææ*, which is undistinguishable in habit  
 from *Vitaceæ*, with which it agrees in har-  
 rescence and in the constant disposition of its  
 flowers to become unisexual, and thus even  
 it differs in being polypetalous and polyspermous,  
 and only half-spermeous. Hence  
 these points of resemblance, *Caprifoliis* probably  
 form the nearest kinship to *Sambucæ*,  
*Sambucæ*, although it has even different leaves. — *Hall 42.*

Natives of the northern parts of Europe, Asia, and America, passing the winter within the limits of the tropics; found very sparingly in northern Africa, and unknown in the southern hemisphere.

The fragrance and beauty of Honeysuckles have been celebrated by poets of every age ; but independently of such a romantic history, the Order of Caprifoliaceæ contains a number of plants of considerable interest. The flowers of the latter are frequently well marked, the leaves fetid, emetic, and a drastic purgative ; others are again powerful emetics. *Viburnum Opulus* (the Gueldres Rose), several other species, and even the Honeysuckle itself. The leaves of *Linnaea borealis* are praised by the Swedish Physicians as emetic and diuretic. The inner bark of *Viburnum Lantana* is supposed to be emetic by some writers among vesicants. The fruit of *Viburnum* is the source of a mucilage, but has, instead, an austere, astringent pulp, which becomes soluble, and is made into a sort of cake by the North American Indians. *Viburnum nudum* is a mild cathartic ; in large doses it produces vomiting. Its dried and roasted leaves have been used as a substitute for Coffee. The bark of *Linnaea canadensis* is a favourite food of the Kamtchadales. The wine made from the fruit of *Viburnum Opulus* is well known in England, and is used as a remedy of all sorts of disorders. According to Mr. Backhouse, there is a species of *Urtica* in Transylvania, which bears a quantity of white sweetish fruit, resembling which nothing else grows in that country.

U. S. N. A.

[illegible]

NUMBERS GEN. 14. S. 220

POSTROX.--Cin. Roman. C. German. 1840. C. German.

11.

Fig. DVIII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 8



## ORDER CCXCV. GALIACEÆ.—STELLATES.

*Stellatæ*, Ray *Synops.* 223. (1690); R. Brown in *Congo*, (1818).—*Galiæ*, Turp. in *Atlas du Nouv. Dict. des Sc.* (?)—*Rubiaceæ*, § *Stellatæ*, Cham. et Schlecht. in *Linnaea*, 3. 220. (1828); DC. *Prodr.* 4. 580; Barth. *Ord. Nat.* 209; Endl. *Gen.* p. 522; Meisner, p. 173.—*Rubiaceæ*, § *Galiæ*, N. ab Es. et Fuhlrott. *Nat. Pflanz. Syst.* 165. (1829).

DIAGNOSIS.—*Cinchonal Exogens*, with epipetalous stamens, straight anthers bursting longitudinally, didymous fruit, and verticillate leaves without stipules.

Herbaceous plants, with whorled leaves, destitute of stipules, and angular stems. Flowers minute. Calyx superior, obsolete, or 4- 5- or 6-lobed. Corolla monopetalous,

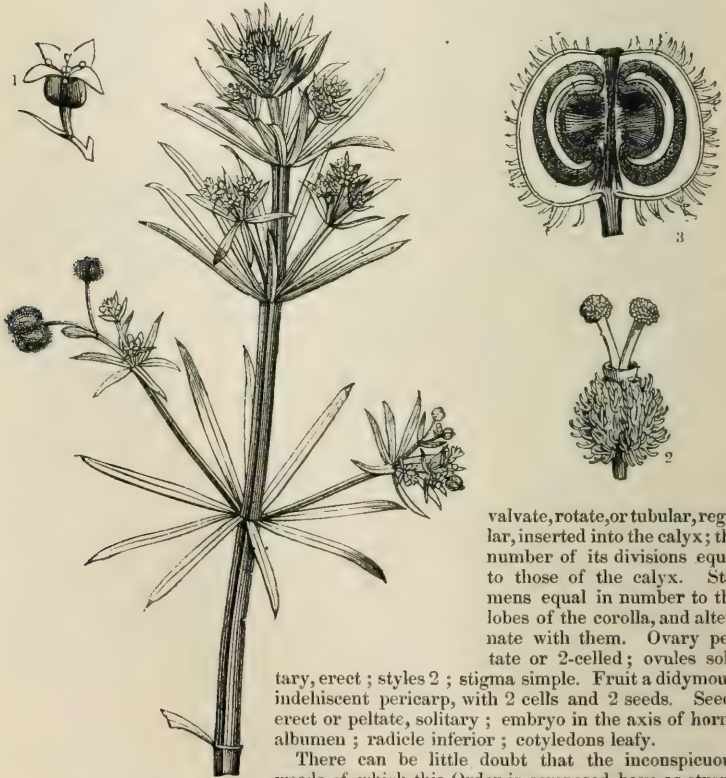


Fig. DIX.

valvate, rotate, or tubular, regular, inserted into the calyx; the number of its divisions equal to those of the calyx. Stamens equal in number to the lobes of the corolla, and alternate with them. Ovary peltate or 2-celled; ovules solitary, erect; styles 2; stigma simple. Fruit a didymous, indehiscent pericarp, with 2 cells and 2 seeds. Seeds erect or peltate, solitary; embryo in the axis of horny albumen; radicle inferior; cotyledons leafy.

There can be little doubt that the inconspicuous weeds of which this Order is composed have as strong a claim to be separated from Cinchonads as that Order from Caprifoliis. It is true that no very positive characters are to be obtained from the fructification, but the want is abundantly supplied by the square stems and verticillate leaves without stipules, forming a kind of star, from which circumstance the name Stellate is derived. Nevertheless, Botanists in most instances appear to be against this opinion: I confess I cannot conceive upon what grounds. Usually a material dissimilarity in habit, if accompanied by any clear character, whether of vegetation or fructification, is considered sufficient for the separation of a group of plants into two Orders; in this case the weak angular stems

Fig. DIX.—*Galium Aparine*; 1. a flower; 2. a young fruit without the corolla; 3. a perpendicular section of a ripe fruit.



[illegible]

Mr. Benthall, in an article in *The Times* before mentioned by Mr. Bland, enters at some length and with great skill into a consideration of the question of the two sides of the question, how divided by the case of the *Prisoners of War*, and the apparent leaves of *Syllable* papers are considered. The following is the part he has arrived at this conclusion and conclusion:—

1. That the following groups in *S. dictyophora* showed no significant difference in leaf area: (a) the 1950-51 and 1951-52 groups, (b) the 1952-53 and 1953-54 groups, (c) the 1954-55 and 1955-56 groups, (d) the 1956-57 and 1957-58 groups, (e) the 1958-59 and 1959-60 groups, (f) the 1960-61 and 1961-62 groups, (g) the 1962-63 and 1963-64 groups, (h) the 1964-65 and 1965-66 groups, (i) the 1966-67 and 1967-68 groups, (j) the 1968-69 and 1969-70 groups, (k) the 1970-71 and 1971-72 groups, (l) the 1972-73 and 1973-74 groups, (m) the 1974-75 and 1975-76 groups, (n) the 1976-77 and 1977-78 groups, (o) the 1978-79 and 1979-80 groups, (p) the 1980-81 and 1981-82 groups, (q) the 1982-83 and 1983-84 groups, (r) the 1984-85 and 1985-86 groups, (s) the 1986-87 and 1987-88 groups, (t) the 1988-89 and 1989-90 groups, (u) the 1990-91 and 1991-92 groups, (v) the 1992-93 and 1993-94 groups, (w) the 1994-95 and 1995-96 groups, (x) the 1996-97 and 1997-98 groups, (y) the 1998-99 and 1999-00 groups, (z) the 2000-01 and 2001-02 groups, (aa) the 2002-03 and 2003-04 groups, (ab) the 2004-05 and 2005-06 groups, (ac) the 2006-07 and 2007-08 groups, (ad) the 2008-09 and 2009-10 groups, (ae) the 2010-11 and 2011-12 groups, (af) the 2012-13 and 2013-14 groups, (ag) the 2014-15 and 2015-16 groups, (ah) the 2016-17 and 2017-18 groups, (ai) the 2018-19 and 2019-20 groups, (aj) the 2020-21 and 2021-22 groups, (ak) the 2022-23 and 2023-24 groups, (al) the 2024-25 and 2025-26 groups, (am) the 2026-27 and 2027-28 groups, (an) the 2028-29 and 2029-30 groups, (ao) the 2030-31 and 2031-32 groups, (ap) the 2032-33 and 2033-34 groups, (aq) the 2034-35 and 2035-36 groups, (ar) the 2036-37 and 2037-38 groups, (as) the 2038-39 and 2039-40 groups, (at) the 2040-41 and 2041-42 groups, (au) the 2042-43 and 2043-44 groups, (av) the 2044-45 and 2045-46 groups, (aw) the 2046-47 and 2047-48 groups, (ax) the 2048-49 and 2049-50 groups, (ay) the 2050-51 and 2051-52 groups, (az) the 2052-53 and 2053-54 groups, (ba) the 2054-55 and 2055-56 groups, (bb) the 2056-57 and 2057-58 groups, (bc) the 2058-59 and 2059-60 groups, (bd) the 2060-61 and 2061-62 groups, (be) the 2062-63 and 2063-64 groups, (bf) the 2064-65 and 2065-66 groups, (bg) the 2066-67 and 2067-68 groups, (bh) the 2068-69 and 2069-70 groups, (bi) the 2070-71 and 2071-72 groups, (bj) the 2072-73 and 2073-74 groups, (bk) the 2074-75 and 2075-76 groups, (bl) the 2076-77 and 2077-78 groups, (bm) the 2078-79 and 2079-80 groups, (bn) the 2080-81 and 2081-82 groups, (bo) the 2082-83 and 2083-84 groups, (bp) the 2084-85 and 2085-86 groups, (bq) the 2086-87 and 2087-88 groups, (br) the 2088-89 and 2089-90 groups, (bs) the 2090-91 and 2091-92 groups, (bt) the 2092-93 and 2093-94 groups, (bu) the 2094-95 and 2095-96 groups, (bv) the 2096-97 and 2097-98 groups, (bw) the 2098-99 and 2099-00 groups, (bx) the 2100-01 and 2101-02 groups, (by) the 2102-03 and 2103-04 groups, (bz) the 2104-05 and 2105-06 groups, (ca) the 2106-07 and 2107-08 groups, (cb) the 2108-09 and 2109-10 groups, (cc) the 2110-11 and 2111-12 groups, (cd) the 2112-13 and 2113-14 groups, (ce) the 2114-15 and 2115-16 groups, (cf) the 2116-17 and 2117-18 groups, (cg) the 2118-19 and 2119-20 groups, (ch) the 2120-21 and 2121-22 groups, (ci) the 2122-23 and 2123-24 groups, (cj) the 2124-25 and 2125-26 groups, (ck) the 2126-27 and 2127-28 groups, (cl) the 2128-29 and 2129-30 groups, (cm) the 2130-31 and 2131-32 groups, (cn) the 2132-33 and 2133-34 groups, (co) the 2134-35 and 2135-36 groups, (cp) the 2136-37 and 2137-38 groups, (cq) the 2138-39 and 2139-40 groups, (cr) the 2140-41 and 2141-42 groups, (cs) the 2142-43 and 2143-44 groups, (ct) the 2144-45 and 2145-46 groups, (cu) the 2146-47 and 2147-48 groups, (cv) the 2148-49 and 2149-50 groups, (cw) the 2150-51 and 2151-52 groups, (cx) the 2152-53 and 2153-54 groups, (cy) the 2154-55 and 2155-56 groups, (cz) the 2156-57 and 2157-58 groups, (da) the 2158-59 and 2159-60 groups, (db) the 2160-61 and 2161-62 groups, (dc) the 2162-63 and 2163-64 groups, (dd) the 2164-65 and 2165-66 groups, (de) the 2166-67 and 2167-68 groups, (df) the 2168-69 and 2169-70 groups, (dg) the 2170-71 and 2171-72 groups, (dh) the 2172-73 and 2173-74 groups, (di) the 2174-75 and 2175-76 groups, (dj) the 2176-77 and 2177-78 groups, (dk) the 2178-79 and 2179-80 groups, (dl) the 2180-81 and 2181-82 groups, (dm) the 2182-83 and 2183-84 groups, (dn) the 2184-85 and 2185-86 groups, (do) the 2186-87 and 2187-88 groups, (dp) the 2188-89 and 2189-90 groups, (dq) the 2190-91 and 2191-92 groups, (dr) the 2192-93 and 2193-94 groups, (ds) the 2194-95 and 2195-96 groups, (dt) the 2196-97 and 2197-98 groups, (du) the 2198-99 and 2199-00 groups, (dv) the 2200-01 and 2201-02 groups, (dw) the 2202-03 and 2203-04 groups, (dx) the 2204-05 and 2205-06 groups, (dy) the 2206-07 and 2207-08 groups, (dz) the 2208-09 and 2209-10 groups, (ea) the 2210-11 and 2211-12 groups, (eb) the 2212-13 and 2213-14 groups, (ec) the 2214-15 and 2215-16 groups, (ed) the 2216-17 and 2217-18 groups, (ee) the 2218-19 and 2219-20 groups, (ef) the 2220-21 and 2221-22 groups, (eg) the 2222-23 and 2223-24 groups, (eh) the 2224-25 and 2225-26 groups, (ei) the 2226-27 and 2227-28 groups, (ej) the 2228-29 and 2229-30 groups, (ek) the 2230-31 and 2231-32 groups, (el) the 2232-33 and 2233-34 groups, (em) the 2234-35 and 2235-36 groups, (en) the 2236-37 and 2237-38 groups, (eo) the 2238-39 and 2239-40 groups, (ep) the 2240-41 and 2241-42 groups, (eq) the 2242-43 and 2243-44 groups, (er) the 2244-45 and 2245-46 groups, (es) the 2246-47 and 2247-48 groups, (et) the 2248-49 and 2249-50 groups, (eu) the 2250-51 and 2251-52 groups, (ev) the 2252-53 and 2253-54 groups, (ew) the 2254-55 and 2255-56 groups, (ex) the 2256-57 and 2257-58 groups, (ey) the 2258-59 and 2259-60 groups, (ez) the 2260-61 and 2261-62 groups, (fa) the 2262-63 and 2263-64 groups, (fb) the 2264-65 and 2265-66 groups, (fc) the 2266-67 and 2267-68 groups, (fd) the 2268-69 and 2269-70 groups, (fe) the 2270-71 and 2271-72 groups, (ff) the 2272-73 and 2273-74 groups, (fg) the 2274-75 and 2275-76 groups, (fh) the 2276-77 and 2277-78 groups, (fi) the 2278-79 and 2279-80 groups, (fj) the 2280-81 and 2281-82 groups, (fk) the 2282-83 and 2283-84 groups, (fl) the 2284-85 and 2285-86 groups, (fo) the 2286-87 and 2287-88 groups, (fp) the 2288-89 and 2289-90 groups, (fq) the 2290-91 and 2291-92 groups, (fr) the 2292-93 and 2293-94 groups, (fs) the 2294-95 and 2295-96 groups, (ft) the 2296-97 and 2297-98 groups, (fu) the 2298-99 and 2299-00 groups, (fv) the 2300-01 and 2301-02 groups, (fw) the 2302-03 and 2303

2. That in a natural oil blend, especially in Yemulid<sub>100</sub>, containing more than 10% larger than the others.

2. That in *Spermophilus* and some tribes of *Sciurini*, the incisor has become wedged with the pulps of the last into a sheath, and that this sheath is one of the bones.

4. That the number of parts in each of  $\alpha$  is approximately twice given,  $\beta$  but that, taking two of the parts for  $\beta$ , it is impossible to obtain exactly  $\beta$  parts these two are separated, because the intermediate process and methods to the state of Stormer's, the result of which is a cavity.

Perhaps this question is more important in respects it is a more difficult one to answer than leaves developed stipules. It is, however, of interest, especially as regards systematic. The present opportunity of saying what I think on this line of argument, and why I so, is to tell

1. With regard to the supposed basis for the search for the origin of the leaves it is to be observed, that if these leaves are really truly living and not mere prophylls to be leaves in Stellates, and also prophylls, they are never more than rudimentary plants have no leaves, but stipules only, but the three and various leaves like opposite leaves are never opposite the axis of the stem, but are lateral and not axillary. Nor do I find that the number of leaves in the leaf of Stellate plants exactly corresponds with the number of their leaves. For example, in *Stellaria media* where the whorls often consist of ten pieces, the stem has only two leaf whorls. Therefore can it be admitted that bodies which do not bear leaves are leaves, and therefore not leaves. All rudimentary organs of a plant, such as stipules, prophylls, possess that power or vitality which is necessary for the development of a particular part. Besides the rudimentary organs mentioned before for in *Asperula* the uppermost branches, *Ononis*, *Onoclea*, etc., which are not alternately with the leaves that form the stem, but which are opposite to the leaves, frequently must, in such cases, arise from the axis of the stem, and not from the leaves. It is more probable that the development of these bodies is a part of the development of the stem is connected with the form of the stem, and that the leaves are not connected with each other. If the form of the stem requires an alternate development of the whorl triplet of opposite branches, then the development of a whorl of opposite leaves will settle the origin of all that surround it. The



the first, third, and fifth leaves produce axillary buds, then in the whorl next above it, the second, fourth, and sixth leaves will probably be gemmiferous, according to the ordinary laws of decussation. It is plainly impossible to say that what seem to be leaves are in reality stipules, because they have no axillary buds; for if that opinion were maintained, it would be necessary to assign the quality of stipules to a certain portion of the leaves of such verticillate plants as *Dysophylla stellata*, in which only a part of the whorls ever produces branches.

2. If it is true that in *Asperula* two opposite leaves are frequently longer than the others, that circumstance may be reasonably ascribed to the greater development consequent upon their higher functions, and to their peculiar position on the stem; and it is equally true that in the greater part of *Stellates* no trace whatever of any kind of difference between the leaves can be detected, as is most remarkably the case in those surrounding the flowers of *Crucianella maritima*.

3. The argument derived from the occasional connection of the leaves by a membrane can hardly be allowed much weight, when it is remembered that in such cases the intermediate leaves are less like stipules than in those cases where no membrane exists; compare *Asperula cynanchica*, or *littoralis*, or *longiflora*, with such genuine *Crucianellas* as *C. maritima*.

4. The comparison of the supposed stipules of *Stellates* and the setæ of *Spermacocœ* is inadmissible, because the former are at all events single simple organs, be they what they may, while the setæ of *Spermacocœ* are the result of the splitting of two parallel-veined stipules, and therefore will necessarily be uncertain in number.

These arguments do not, however, by any means exhaust the question; and therefore I proceed to make a few additional remarks upon a point not yet adverted to. It is in *Asperula*, more than in any other genus of the Order, that is to be found evidence favourable to the supposition of M. De Candolle and his followers. In *A. longiflora*, *cynanchica*, and some others, the lower whorls are in the usual state, but the upper ones are reduced to two perfect leaves, with one or sometimes two teeth or subulate processes between them, which remain. In this condition the structure of *Asperula* is so very like that of many *Spermacocœous* plants, that the analogy between them seems indisputable; and I presume that it was such cases which first led to the theory under consideration.

It is, however, to be remembered, that in *Stellates* the supposed stipules are always what first disappear in the process of reduction in the number of foliaceous appendages; but that in *Cinchonads* it is in many cases the leaves which are first lost when such a reduction takes place. The latter fact is readily verified upon reference to any of the capitate *Spermacocœs*, where the bracts are evidently stipules, and especially to *S. calyptera*, in which the leaves are gradually merged in the large membranous cup that subtends the flowers, while the stipules suffer no diminution. The same circumstance may be observed in several Brazilian *Cinchonads* allied to *Psychotria barbiflora*, and in *Paederia foetida*. It is also possible that the large coloured involucre of *Cephaelis* is, at least in some cases, formed by the excessive development of stipules and suppression of the leaves, for such is undoubtedly the case in a *Sierra Leone* plant in my possession, which I presume is the little-known *C. bidentata* of Thunberg. These facts render it more probable than ever that *Stellates* and *Cinchonads* are essentially different Natural Orders; for they would seem to show that while the first has verticillate foliaceous organs, the most imperfect of which have the greater tendency to disappear, the second has verticillate foliaceous organs, the most perfect of which have the greater tendency to become abortive. I need scarcely add, that after a full consideration of this point I retain my original conviction, that the apparent leaves of *Stellates* are really leaves, and not stipules, and that the Order is as distinct from *Cinchonads* as *Nightshades* from *Figworts*, *Verbenes* from *Labiates*, and I might even add, as *Cinchonads* themselves from *Umbellifers*.—See *Bot. Reg.* 1838. 55. To be consistent, then, we must either combine *Caprifolios* with *Cinchonads*, or we must preserve *Stellates* separate. Properly speaking, the appellation *Rubiaceæ* should be confined to the latter group, as it comprehends the genus *Rubia*; but that name has been so generally applied to the larger mass now comprehended under the name of *Cinchonads*, that I find it better to abolish that of *Rubiaceæ* altogether.

Natives of the northern parts of the northern hemisphere, where they are extremely common weeds, and of high mountainous regions in Peru, Chili, and Australasia.

First among them stands *Madder*, the root of *Rubia tinctoria*, one of the most important dyes with which we are acquainted; a quality in which other species of *Stellates* participate in a greater or less degree. The roots of *Rubia cordifolia* (*Munjista*, *Roxb.*) yield the *Madder* of Bengal, and form even an article of the export commerce to Europe, under the name of *Munjeeth*. *Rubia angustissima*, from Tong Dong, has also highly-coloured roots, and *Rubia Relboun* is the *Madder* of Chili. It has been remarked







## ALLIANCE LV. UMBELLALES.—THE UMBELLAL ALLIANCE.

DIAGNOSIS.—*Epigynous Exogens, with dichlamydeous polypetalous flowers, solitary large seeds, and a small embryo lying in a large quantity of albumen.*

The combination of a polypetalous corolla, an inferior fruit, and solitary seeds chiefly consisting of albumen, constitute the distinctive character of this Alliance, whose Orders can by no means be separated, whatever mode of general distribution a Botanist may employ. In fact, Umbellifers differ from Ivyworts in nothing except their peculiar epigynous disk, and didymous fruit. Ivyworts are hardly distinguishable from Cornels, if we neglect the opposite leaves and tetramerous flowers of the latter; and from Witch Hazels there is little to separate Cornels, except the valvate corolla and exstipulate leaves of the latter; finally, Bruniads rely for their definition more upon their want of stipules, and anthers turned outwards than on anything else.

If we look to the affinities of this Alliance, we shall again have an instance of a most natural group being so touched at all points of its circumference that it may be almost regarded as a peculiar centre of organisation, from which many other groups diverge.

Thus, in a direct line, Umbellifers touch Stellates on the one hand, and Ivyworts on the other, as is elsewhere explained. Then in lateral affinity we have Umbellifers closing in upon Crowfoots, and stretching towards Saxifrages, Ivyworts almost invading the territory of Vineworts and Caprifolds, Cornels owing their position as a distinct Order, rather than as a mere group of Garryads or Alangiads? chiefly to their unisexual dichlamydeous flowers on the one hand, and their valvate corolla on the other. Witch Hazels have, no doubt, a strong relationship to Mastworts (Corylaceæ) on the one hand, and Hippurids on the other, and finally, the affinity of Bruniads to Myrtleblooms is sufficiently shown in speaking of their Natural Order; so that the following may be taken as a representation of the way in which the Natural Orders of Umbellals stand with respect to others.

## Galiacæ.

<i>Saxifragacæ</i> . . . . .	<i>Apiacæ</i> . . . . .	<i>Ranunculacæ</i> .
<i>Caprifoliacæ</i> . . . . .	<i>Araliacæ</i> . . . . .	<i>Vitacæ</i> .
<i>Alangiæ</i> . . . . .	<i>Cornacæ</i> . . . . .	<i>Garryacæ</i> .
<i>Haloragacæ</i> . . . . .	<i>Hamamelidacæ</i> . . . . .	<i>Corylacæ</i> .
<i>Rhamnaceæ</i> . . . . .	<i>Bruniaceæ</i> . . . . .	<i>Myrtacæ</i> .

## Santalacæ.

## NATURAL ORDERS OF UMBELLALS.

<i>Fruit didymous, with a double epigynous disk</i> . . . . .	296. APIACEÆ.
<i>Fruit not didymous, without a double epigynous disk, 3- or more-celled. Pentamerous flowers. Corolla valvate. Leaves alternate, without stipules. Anthers turned inwards, opening lengthwise</i> }	297. ARALIACEÆ.
<i>Fruit not didymous, without a double epigynous disk, 2- or more-celled. Tetramerous flowers. Corolla valvate. Leaves opposite, without stipules</i> . . . . .	298. CORNACEÆ.
<i>Fruit not didymous, without a double epigynous disk, 2-celled. Corolla imbricated. Leaves alternate, with stipules. Anthers with deciduous valves</i> . . . . .	299. HAMAMELIDACEÆ.
<i>Fruit not didymous, without a double epigynous disk, 3- (or 1-) celled. Corolla imbricated. Leaves alternate, without stipules. Anthers turned outwards, opening lengthwise</i> . . .	300. BRUNIACEÆ.



## DIME CCXCVI. ADJECTIVE. D.

4. *See, e.g.,* *Exxon Corp. v. Mobil Oil Corp.*, 696 F.2d 1153, 1160 (5th Cir. 1982) (citing *Exxon Corp. v. Mobil Oil Corp.*, 696 F.2d 1153, 1160 (5th Cir. 1982)).

**DIAGNOSIS.**—*I. pilosifera* Linn., with glabrous legs.

Herbaceous plants, often with p. with white or bluish greenish green; leaves simple, sometimes simple, sheathing at the base; flowers small, usually



Veins. Flowers in nodding cymes, peduncles or stalks generally surrounded by an involucre. Calyx superior, yellow-white or greenish. Petals 5, and in some species of a fleshy, egg-shaped disk; usually inflated at the point, sometimes somewhat horn-like, valvate. Stamens 5, alternant with the petals, inserted in the middle of the petals. Pistil 2-celled, with solitary reniform ovules, covered by a double fleshy disk; styles 2, distinct; stigma simple. Fruit consisting of 2 carpels, separate from the common axis, to which they adhere by their base (the umbilicus); each carpel traversed by a curved ridge of which 2 are primary, and 4, alternating with them, secondary; the ridges are separated by channels, hence, which are the place, at the summit of the pericarp, where the receptacles of enlarged oily matter called resin, and pendulous, usually adhering inseparably to the pericarp, at the base of abundant horny albumen, are situated. *Ar. the African.*

[illegible]

FIG. 10. *Althausia corymbosa*. 1, a young plant with the two early leaves; 2, a young plant with the first pair of leaves; 3, a young plant with the first pair of leaves and the first pair of leaflets.

FIG. 10X1-12. *Antennae* (A).



experienced eye, so much are they at variance with the usual structure of Umbellifers

In all these cases, however, the very peculiar condition of the flower and fruit is abundantly sufficient to mark the Order. Indeed we have no knowledge of any one group so entirely free from deviations from the typical structure, ex-



Fig. DXII.



Fig. DXIII.

cept in accidental monsters. Of these I once found an instance, at Burnham Priory, near Maidenhead, in which the calyx was detached from the ovary, which had become superior, the calyx surrounding it loosely like a 5-toothed ribbed cup. This is quite inconsistent with the theory of Schykoffsky, who assumes that in Umbellifers the calyx proceeds really from the same point as the styles.—*Bot. Reg.* 1841. *Misc.* 35.

It is also stated that in some accidental cases 3 carpels have been found. In *Erynium* and some *Bupleurums* the leaves consist of nothing but petiole, and thus present the appearance of Endogens. Among the more remarkable facts connected with the structure of the fruit are, 1, the separation of it when ripe into 2 carpels or mericarps, adhering to a stylopod or forked placenta, eventually exterior to the carpels themselves, although in the beginning it must have been included between their confluent margins, between which it rose till near the summit of the cavity, when it turned inwards to bear the solitary ovules; and 2, the presence in the pericarp of fistular passages filled with oil; the latter are no doubt analogous to the cysts of Orange and other leaves, and to the glands of Labiates and some Composites, but they are remarkable for a uniformity in position and number, which, although not absolute, is nevertheless very different from the indefinite nature of common cysts.

Umbellifers differ from Ivyworts in their seed adhering to the pericarp, in their imbricated corolla, and in the two divisions into which their dry fruit always resolves itself eventually. Ivyworts, on the contrary, have a loose seed, a valvate corolla, and more divisions of their succulent fruit than two. The genus *Horsfieldia*, however, forms a complete transition, having the valvate corolla of Ivyworts and their peculiar habit, with the dimerous dry fruit and adherent seed of Umbellifers. As to their other affinities it may be remarked, that they completely represent in the epigynous sub-class the Crowfoots among hypogynous Exogens; some *Thalictrums* indeed would make pretty good Umbellifers, if their calyx adhered to the side of the ovary. They approach Stellates in their didymous inferior fruit and copious albumen, but they are universally polypetalous. With Saxifrages Umbellifers agree in habit, if *Hydrocotyle* is compared with *Chrysosplenium*, and if the sheathing and divided leaves of the two Orders are considered. To Cranesbills De Candolle remarks that Umbellifers are allied, in consequence of the cohesion of the carpels around a woody axis, and of the umbellate flowers which grow opposite the leaves, and also because the affinity of Cranesbills to Vines, and of the latter to Ivyworts, is not to be doubted. The resem-

Fig. DXII.—*Leucolena rotundifolia*.—Hooker.

Fig. DXIII.—*Bolax glebaria*.—Hooker.







others), the following brief enumeration will sufficiently explain the purposes to which Umbellifers are applicable :—

Of the hairless species, in which, with a little aroma, there is no considerable quantity of acrid watery matter or gum-resinous secretion, must be more particularly named Celery, Fennel, Samphire, Parsley, and the roots of Carrots, Parsnips, and Skirrets (*Sium Sisarum*). In addition to these, with which everybody is familiar, the following plants more particularly deserve mention as esculents:—The root of *Eryngium campestre* and *maritimum*, vulgarly called Eryngo, is sweet, aromatic, and tonic. Boerhaave reckons it as the first of aperient diuretic roots. It has been recommended in gonorrhœa, suppression of the menses, and visceral obstructions, particularly of the gall-bladder and liver; it has also the credit of being a decided aphrodisiac. A good deal of it is sold in a candied state. The roots of *Meum athamanticum* and *Mutellina* are aromatic and sweet, and form an ingredient in the compound called Venice treacle. Angelica root, belonging to *Archangelica officinalis*, is fragrant, bitterish, pungent, sweet when first tasted, but leaving a glowing heat in the mouth. The Laplanders extol it not only as food but medicine. In coughs, hoarseness, and other pectoral disorders they eat the stalks roasted in hot ashes; they also boil the tender flowers in milk till it attains the consistence of an extract, which they use to promote perspiration in catarrhal fevers, and to strengthen the stomach and bowels in diarrhœa. It is sold in the shops in a candied state, and was once an inhabitant of every country garden. Chervil, an old-fashioned pot-herb, with eatable roots, is the *Anthriscus Cerefolium*. *Smyrnium Olusatrum*, or Alexanders, was formerly cultivated instead of Celery; its leaves have a slight and pleasant aromatic flavour. The tubers of *Bunium ferulaceum* are eaten in Greece under the name of Topana. Samphire (*Crithmum maritimum*) is one of the best of all ingredients in pickles. *Carum Bulbocastanum*, the Pignut of the English, is quite wholesome, as are also the tubers of (*Enanthe pimpinelloides*). *Anesorhiza capensis* and *Fœniculum capense* are both Cape esculents. *Arracacha esculenta*, an inhabitant of the table-land of Grenada, has large esculent roots resembling a Parsnip in quality, but better. Finally, *Prangos pabularia*, a herbaceous plant inhabiting the arid plains of Southern Tartary, and the adjoining provinces, has a great reputation as a sheep food, which it appears not to deserve. Dr. Royle thinks that it may have been one of the kinds of *Sylphion* of the Greeks—that described by Arrian as growing only with Pines on Paropamisus, where it was browsed on by numerous flocks of sheep and cattle. Lieut. Burnes, crossing in the direction of Alexander's route, found this in the same situation, greedily cropped by sheep, and even eaten by his fellow-travellers. The natives of the north of Asia esteem highly the skinned root of the sweet subacrid *Heracleum Sphondylium*.

Among the gum-resinous species those yielding Asafœtida hold the first rank. The fetid odour of these plants is supposed to be owing to sulphur in combination with their peculiar essential oil. Asafœtida is the milky juice of various species of *Ferula* inhabiting Persia and neighbouring countries. Of these *F. Asafœtida* is the plant described by Kæmpfer (*Aman. Eeot.* 535); but *F. persica* and others are no doubt also the origin of the drug. Griffith was of that opinion (*Ann. N. Hist.* X. 193); and the fruits sent home to me by Sir John McNeill prove the fact.—See *Fl. Med.* No. 109. Burnes found Asafœtida plants on the mountains of the Hindoo Koosh regarded as a highly nutritious sheep-food. The *Asaduleis*, or *Laser Cyrenaicum*, was yielded by a *Thapsia*, and probably *Thapsia garganica*. This drug was in high reputation among the ancients for its medical uses; it had miraculous powers assigned to it; to neutralise the effects of poison, to cure envenomed wounds, to restore sight to the blind, and youth to the aged, were only a part of its reputed properties; it was also reckoned antispasmodic, deobstruent, diuretic, &c., &c. So great was its reputation, that the princes of Cyrene caused it to be struck on the reverse of their coins; and the Cyrenean doctors were reckoned among the most eminent in the world. Its value was estimated by its weight in gold. The plants appear to be in reality very active purgatives. Galbanum, another fetid gum-resin, has been referred to *Galbanum officinale*, a Syrian plant; but it has been demonstrated to owe its origin to another Umbellifer, the *Opechia galbanifera*, a Persian plant.—See *Bot. Reg.* 1839, *Misc.* 107. Martius, however, and others maintain that this *Opechia* yields the Persian Galbanum only, and that it is really the produce of different Umbellifers. *Opopanax* is the concrete juice of *Opopanax Chironum*, a plant resembling a Parsnip, and inhabiting the Levant. *Ammoniacum* has a more doubtful origin; as a Persian sort has been made out to be derived from *Dorema Ammoniacum*, but as Dioscorides says that his plant *γυνῶται ἐν Λιβύῃ κατὰ Ἀγυῶνα*, it was probably derived from *Ferula orientalis*, which still furnishes a drug of the kind in the kingdom of Morocco. The origin of *Sagapenum*, a drug between Galbanum and Asafœtida, is not ascertained with certainty; it is thought to be derived from either *Ferula persica* or *F. Szowitsiana*. Secretions of a similar nature are yielded by *Bolax glebaria*, a curious beehive-shaped plant, in southern Chile; *Peucedanum*



[illegible]

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For their aromatic and substituted series the most utilized was Ethyl Phenyl Acrylate (Acrisum), Diethyl Acrylate (Acrocrisum), Ethylhexyl Acrylate (Acrocrisum), and Acrocrisum (Acrocrisum). Besides these, great quantities of these series are also employed. For the same reason, the class of which are the Acrylates of Acrylates of Terephthalic Acid (Acrylates), Harnett (1956, Acrylates), a few others used of Ethyl and Ethylhexyl Acrylates (Acrylates), were only used in secondary reactions.

[illegible][illegible]



## GENERA.

## I. HYDROCOTYLIDÆ.

Hydrocotyle, *Tournef.*  
*Chondrocarpus*, Nutt.  
*Glyceria*, Nutt.  
*Centella*, Linn.  
*Solandra*, Linn. fil.  
*Crantzia*, Nutt.  
*Cesatia*, Endl.  
*Dimetopia*, DC.  
*Erigenia*, Nutt.  
*Micropleura*, Lagasc.  
*Didiscus*, DC.  
*Hiigella*, Reichenb.  
*Pritzella*, Walpers.  
*Trachymene*, Rudge.  
*Azorella*, Labill.  
*Fischera*, Spreng.  
*Catepha*, Leschen.  
*Astrotrocha*, DC.  
*Leucolæna*, R. Br.  
*Xanthosia*, Rudge.  
*Cruciella*, Leschen.  
*Pentapeltis*, Endl.  
*Schænolæna*, Bunge.  
*Bowlesia*, Ruiz et Pav.  
*Azorella*, Lam.  
*Chamitis*, Soland.  
*Siembra*, Reichenb.  
*Fraxosa*, Ruiz et Pav.  
*Pectophytum*, H.B.K.

## II. MULINIDÆ.

*Bolax*, *Commers.*  
*Mulinum*, Pers.  
*Asteriscium*, Cham.  
*Cassidocarpus*, Presl.  
*? Dipterygia*, Presl.  
*Elsneria*, Walp.  
*Laretia*, Gill. et Hook.  
*Drusa*, DC.  
*Huanaca*, Cav.  
*Homalocarpus*, Hook. et Arn.  
*Diposis*, DC.  
*Spananthe*, Jacq.  
*Pozoa*, Lagasc.  
*Schizilema*, Hook. f.

## III. SANICULIDÆ.

*Actinotus*, Labill.  
*Eriocalia*, Smith.  
*Prostia*, Lagasc.  
*Holotome*, Benth.  
*Petagnia*, Guss.  
*Heterosciadium*, DC.  
*Klotschia*, Cham.  
*Sanicula*, *Tournef.*  
*Hacquetia*, Neck.  
*Dondia*, Spreng.  
*Dondisia*, Reichenb.  
*Astrantia*, *Tournef.*  
*Actinolema*, Fenzl.  
*Alepidea*, Laroche.  
*Eryngium*, *Tournef.*  
*Lessonia*, Bert.  
*Strebanthus*, Raf.  
*Horsfieldia*, Blum.  
*Schubertia*, Blum.  
*Actinanthus*, Ehrenb.  
*Hohenackeria*, Fisch. et Mey.

## IV. AMMINIDÆ.

*Rumia*, Hoffm.  
*Cieuta*, Linn.  
*Zizia*, Koch.  
*Smyrniun*, Ell.  
*Thaspium*, Nutt.  
*Apium*, Hoffm.  
*Oreosciadium*, DC.  
*Petroselinum*, Hoffm.

*Wydleria*, DC.  
*Trinia*, Hoffm.  
*Apinella*, Neck.  
*Spielmannia*, Guss.  
*Helosciadium*, Koch.  
*Callistroma*, Fenzl.  
*Elaeosticta*, Fenzl.  
*Sium*, Adams.  
*Mauchartia*, Neck.  
*Cyclospermum*, Lagasc.  
*Trachysciadium*, DC.  
*Discopleura*, DC.  
*Phlimum*, Raf.  
*Leptocaulis*, Nutt.  
*Spermolepis*, Raf.  
*Ptychotis*, Koch.  
*Microsciadium*, Boiss.  
*Gymnoscium*, Hochst.  
*Bunium*, Lagasc.  
*Ammoides*, Adams.  
*Trachyspermum*, Link.  
*Anmios*, Mönch.  
*Heteroptycha*, DC.  
*Critanum*, Bess.  
*Falcaria*, Rivin.  
*Drepanophyllum*, Hfn.  
*Prionitis*, Delarbr.  
*Hladnickia*, Reichenb.

*Sison*, Lagasc.  
*Schultzia*, Spreng.  
*Amni*, *Tournef.*  
*Vinaga*, Gärtn.  
*Gohoria*, Neck.  
*Ægopodium*, Linn.  
*Podagraria*, Rivin.  
*Carum*, Koch.  
*Elwendia*, Boiss.  
*Symphodium*, Koch.  
*Bulbocastanum*, Adams.  
*Lomatocarpum*, Fisch.  
*Bunium*, Koch.  
*Conopodium*, DC.  
*? Deringa*, Adams.  
*Chamaesciadium*, C.A.M.  
*Cryptotænia*, DC.  
*Lereschia*, Boiss.  
*Cyrtospermum*, Raf.  
*? Alacospermum*, Neck.  
*Pimpinella*, Linn.  
*Tragoselinum*, *Tournef.*  
*Pimpinella*, Spreng.  
*Tragium*, Spreng.  
*Ledeburia*, Link.  
*Anisum*, Adams.  
*Reutera*, Boiss.  
*Berula*, Koch.  
*Sium*, Koch.  
*Ridolfia*, Moric.  
*Muretia*, Boiss.

*Sisarum*, Adams.  
*Bupleurum*, *Tournef.*  
*Agostana*, Salisb.  
*Diaphyllum*, Hoffm.  
*Isophyllum*, Hoffm.  
*Tenoria*, Spreng.  
*Euprestis*, Spreng.  
*Odonites*, Spreng.  
*Diatropa*, Dumort.  
*Trachypleurum*, Rehb.  
*? Orimaria*, Raf.  
*Atenia*, Hook. et Arn.  
*? Edosmia*, Nutt.  
*Neurophyllum*, Torr.  
*Heteromorpha*, Cham.  
*Furnrohria*, Koch.

## V. SESELINIDÆ.

*Lichtensteinia*, Cham.  
*Ottoa*, H. B. K.  
*Enanthe*, Lam.  
*Phellandrium*, Linn.  
*Haplosciadium*, Hochst.

*Platysace*, Bunge.  
*Chamairea*, Eckl. et Zeyh.  
*Anesorhiza*, Cham. et Schl.  
*Anisopleura*, Fenzl.  
*Sclerosciadium*, Koch.  
*Dasyloma*, DC.  
*Cynosciadium*, DC.  
*Æthusa*, Linn.  
*Fœniculum*, Adams.  
*Kundmannia*, Scop.  
*Brignolia*, Bertolon.  
*Campderia*, Lagasc.  
*Deverra*, DC.  
*Pithyranthus*, Viv.  
*Eremocarpus*, Bunge.  
*Soranthus*, Ledeb.  
*Eriocycla*, Lindl.  
*Todaroa*, Parl.  
*Seseli*, Linn.

*Hippomarathrum*, Riv.  
*Marathrum*, Raf.  
*Musineon*, Raf.  
*Elæochytris*, Fenzl.  
*Polemyrtus*, Schlecht.  
*Polemannia*, Eckl. et Zh.  
*Libanotis*, Crantz.  
*Athamantia*, Scop.  
*Eriotis*, DC.  
*Xatardia*, Meisn.  
*Petitia*, Gay.  
*Cenolophium*, Koch.  
*Dethawia*, Endl.  
*Wallrothia*, DC.  
*Cnidium*, Cuss.  
*Selinum*, Lagasc.  
*Hymenidium*, Lindl.  
*Thaspium*, Nutt. DC.  
*Trochiscanthes*, Koch.  
*Athamantia*, Koch.  
*Tinguarra*, Parl.  
*Turbith*, Tausch.  
*Libanotis*, Scop.  
*Ligusticum*, Linn.  
*Anisopleura*, Fenzl.  
*Aciphylla*, Forst.  
*Anisotome*, Hook. f.  
*Gingidium*, Forst.  
*Trachydium*, Lindl.  
*Silaus*, Bess.  
*Meum*, *Tournef.*  
*Endressia*, Gay.  
*Neogaya*, Meisn.  
*Gaya*, Gaud.  
*Pachypleurum*, Reich.  
*? Arpitium*, Neck.  
*Conioselinum*, Fisch.  
*Cszernawia*, Turcz.  
*Crithmum*, *Tournef.*

## VI. PACHYPLEURIDÆ.

*Kruberia*, Hoffm.  
*Ulospermum*, Link.  
*Capnophyllum*, Lagasc.  
*Pachypleurum*, Ledeb.  
*Phloidiocarpus*, Turcz.  
*Stenocellum*, Ledeb.

## VII. ANGELICIDÆ.

*Levisticum*, Koch.  
*Ligusticum*, Lagasc.  
*Uloptera*, Fenzl.  
*Heteroptilis*, E. Meyer.  
*Gomphopetalum*, Turcz.  
*Selinum*, Hoffm.  
*Mylinum*, Gaud.  
*Thyselimum*, Adams.  
*Carvifolia*, Vail.  
*Ostericum*, Hoffm.  
*Angelica*, Hoffm.  
*Archangelica*, Hoffm.  
*Uloptera*, Fenzl.

## VIII. PEUCEDANIDÆ.

*Opoponax*, Koch.  
*Ferula*, *Tournef.*  
*Ferulago*, Koch.  
*? Lomatium*, Raf.  
*Cogswellia*, Schult.  
*Polycyrtus*, Schlecht.  
*Dorema*, Don.  
*Eriosynaphe*, DC.  
*Peucedanum*, Linn.  
*Palimbia*, Bess.  
*Pteroselinum*, Reichb.  
*Selinum*, Gärtn.  
*Caroselinum*, Grise.  
*Thyselinum*, DC.  
*Cervaria*, Gärtn.  
*Oreoselinum*, Duby.  
*Imperatoria*, Linn.  
*Euryptera*, Nutt.  
*Leptotænia*, Nutt.  
*Xanthogalum*, Lalem.  
*Sciothamnus*, Endl.  
*Dregea*, Eckl. et Zeyh.  
*Cynorrhiza*, Eckl. et Zyh.  
*Lefeburia*, A. Rich.  
*Callisace*, Fisch.  
*Bubon*, Linn.  
*Galbanophora*, Neck.  
*Agastilis*, Spreng.  
*Anethum*, *Tournef.*  
*Cortia*, DC.  
*Hammatoacaulis*, Tausch.  
*Capnophyllum*, Gärtn.  
*Rumia*, Link.  
*Tiedemannia*, DC.  
*Oxyopolis*, Raf.  
*Archemora*, DC.  
*Lophotænia*, Griseb.  
*Pastinaca*, *Tournef.*  
*Malabaila*, Hoffm.  
*Leiotulus*, Ehrenb.  
*Astydamia*, DC.  
*Symphyloma*, C.A. Mey.  
*Stenotænia*, Boiss.  
*Heraclium*, Linn.  
*Sphondylium*, *Tournef.*  
*Tetratænium*, DC.  
*Carmelia*, DC.  
*Wendtia*, Hoffm.  
*Trichogonium*, DC.

*Barysoma*, Bunge.  
*Zozimia*, Hoffm.  
*Ducrosia*, Boiss.  
*Trigonosciadium*, Boiss.  
*Polytænia*, DC.  
*Eurytænia*, Nutt.  
*Johrenia*, DC.  
*Diplotænia*, Boiss.  
*Hasselquistia*, Linn.  
*Ainsworthia*, Boiss.  
*Tordylium*, *Tournef.*  
*Condyllocarpus*, Hoffm.  
*Synelosciadium*, Boiss.  
*Tordyliopsis*, DC.  
*Tordylioides*, Wall.

## IX. SILERIDÆ.

*Agasyllis*, Hoffm.  
*Siler*, Scop.  
*Bradacia*, Neck.  
*Galbanum*, Don.  
*Ormosolenia*, Tausch.

## X. CUMINIDÆ.

*Cuminum*, Linn.  
*Froriepia*, Koch.  
*Tropocarpus*, Nutt.

## XI. THAPSIDÆ.

*Thapsia*, *Tournef.*  
*Cymopterus*, Raf.



[illegible]

Accepted: July 2001.

POSITION.—Araliaceae. — A small tree. Himalayas, Northern India.

[illegible]

COOTING DE COCHES			
HYDROPHYLIDE	Amphipoda, 100	100	100
Microstomatinae, 100			
Haplomacrinae, 100			
MOLLUSCIDE	100	100	100
Hydrozoa, 100			
Polysiphonia, 100			
SARCOPODE	100	100	100
Homotrypa, 100			
Amphipoda	100	100	100
Pectocidium, 100			



## ORDER CCXCVII. ARALIACEÆ.—IVYWORDS.

*Araliæ*. Juss. Gen. 217. (1789).—*Araliaceæ*. A. Richard in *Dictionnaire Classique d'Histoire Naturelle*, 1. 506. (1822); *DC. Prodr.* 4. 251. (1830); *Bartling Ord. Nat.* 237. (1830); *Endl. Gen.* clxiii.; *Wight Illustr.* 2. t. 118.

**DIAGNOSIS.**—*Umbellal Exogens*, with a 3- or more-celled fruit without a double epigynous disk, pentamerous flowers, a valvate corolla, alternate leaves without stipules, and anthers turned inwards, opening lengthwise.

Trees, shrubs, or herbaceous plants, with in all respects the habit of Umbellifers. Calyx adherent, entire or toothed. Petals definite, 2, 5, 10, deciduous, valvate in æstivation, occasionally 0. Stamens equal in number to the petals or twice as many, arising from within the border of the calyx, and from without an epigynous disk. Ovary inferior, with more cells than 2; ovules solitary, pendulous, anatropal; styles equal in number to the cells, sometimes connate; stigmas simple. Fruit succulent or dry, consisting of several 1-seeded cells. Seeds solitary, pendulous, adhering to the pericarp; albumen fleshy, having a minute embryo at the base, with its radicle pointing to the hilum.

In many respects these plants are much like Umbellifers, from which they are distinguished by their ovary having more cells than 2, and by their greater tendency to form a woody stem; to this may also be in general added a valvate corolla; but *Didiscus* is valvate among Umbellifers, and *Adoxa* in Ivywords is not. There is also a connection with *Caprifoli*s, established by means of *Hedera* and *Viburnum*. Vinewords, too, may be considered a mere hypogynous form of Ivywords, and must be regarded as representing them in the hypogynous sub-class, as will be most evident if *Aralia racemosa* is compared with certain species of *Cissus*.

*Gunnera*, a singular genus with dimerous ♂ ♀ or ♂ flowers, and a single ovule suspended from the apex of the cavity, seems to be a degraded form of this Order, and the genus *Adoxa* is also quite anomalous, though in a different way. Its stamens are slit half way down, so as to appear as if made up of 2 half anthers each; its petals are united into an imbricated monopetalous corolla; and it usually has a calyx whose sepals do not correspond in number with the lobes of the corolla. De Candolle thought this corolla to be a whorl of abortive stamens, but there does not appear to be any sufficient ground for his opinion. See DeCaisne in *Ann. Sc. Nat. n. s. vi.* 72. In several instances a tendency to the separation of stamens and pistil is observable; it is usually, however, accompanied by the common ♂ structure.

The species are found in the tropical and sub-tropical regions of all the world; and even in some of the coldest, as in the United States, Canada, the north-west coast of America, and Japan. *Aralia polaris* was even found by Dr. Jos. Hooker, as far to the south as Lord Auckland's group of islands, in 50½° south latitude.

Similar as these plants are to Umbellifers they do not appear to partake in any considerable degree of the dangerous qualities for which some of the latter are known. On the contrary, they are more generally stimulant and aromatic. Neither do their succulent fruits often yield the essential oil which renders many of the Umbellifers useful emminatives and stomachics. The Ginseng, or Ginschen root, so highly prized by the Chinese as a stimulant, belongs to some species of *Panax* (*P. Ginseng, Meyer*) unknown. Meyer describes it as having a sharp, aromatic, peculiar taste. The Chinese are said to administer it in all diseases resulting from weakness of the body.—*Chem. Gaz.* 1843. 238.



Fig. DXVI.

Fig. DXVI.—1. *Hedera Helix*; 2. flower of *Dimorphanthus edulis* (Siebold); 3. perpendicular section of the ovary; 4. undivided ovary; 5. ripe fruit; 6. cross section of it; 7. section of seed of *H. Helix*.



Although its virtues have been pronounced imaginary, it is so general a remedy that the root should have called forth great notice if it were false. It has, however, been proved to belong to *Panax ginseng*, and for that reason to have been a valuable species so named to such a purpose, or be sold by the American people, without substitute for their Chinese root. It has also been able to furnish a very good remedy, such as Laqueur's. *Panax fruticosum* and *multiflorum* are frequent substitutes employed in the Moluccas, and *P. Amurensis* has become well at the sale of the bark and leaves of bears. The Arabic root is very similar in these parts; it is generally produced from *A. racemosa*, *spinosa* and *hirsuta*. *A. aculeata*, *capitata*, *capitata*, and *capitata* employed in North America as a substitute for *ginseng*. *P. officinale* (Chinese) is employed in China as a substitute for *ginseng*, as being derived from the same family, and its root, which is bitter, aromatic, and pleasant to the taste, is employed in Japan, in winter, as we use *Sassafras*. Not does the common *P. officinale* grow of the Order, although important to sell. It is mentioned in a number of old books as being a tonic. *Hedera nigrifolia*, an English plant, it is said to have a root-scented like Lavender and Rosemary, and *H. heliophila* (Linn.) is a plant of enormous substance smelling of turpentine. Chinese people of *Panax* is common in the roots are used by tanners, while the fleshy *halimolobos* are used. Mr. Linné (Linn.) is growing on the southern coast of China, and it is the best part of the root of *ginseng*. Rhubarb on a gigantic scale. He measured a hole, which was nearly 7 feet in diameter, and remarked that each plant produced 4 or 5 of these enormous roots, growing together a noble appearance.<sup>20</sup> The fruit of *Centuria fruticulosa* is said to be stimulant.

0. 5 2 5 0 0 0

PARRYAN *et al.*

1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 25

Department of Zoology, University of California, Davis, Calif.

15. 10. 1941.

CHAMBERLAIN, J. P. 1983.  
Mammals of the United States.

Colonyville, River of Par.

Cellulose, 100% alkali, 100% free, 100%  
H<sub>2</sub>O, 100% free, 100% free

continued, D. 111.

1. *Chlorophyll a* (Chl *a*)

Pressure: 1 bar

1. *Psychology* 2. *Psychology*

1448 *Journal of Interpersonal Violence*

I am a student of the University of  
 Alabama at Birmingham.

1. The first is the *Journal of the American Medical Association*, which is the most widely read and influential of the medical journals. It is published weekly and covers a wide range of topics, including clinical medicine, public health, and medical education. The journal is known for its high standards of quality and its commitment to providing accurate and reliable information to its readers.

Figure 10.10

— 1.3 —

November 1955, 11. - 1956, 10.

1

Position: Agent - Agent's Name: Agent's Title: Date: \_\_\_\_\_

1. *Journal of the American Medical Association*, 1997; 277: 1033-1038.



1. 1 N. N. 1



## ORDER CCXCVIII. CORNACEÆ.—CORNELS.

Caprifoliaceæ, § Corneæ, Kunth Nov. G. Amer. 3. 430.—Corneæ, DC. Prodr. 4. 271. (1830); Endl. Gen. clxv.; Meisner, p. 143.

DIAGNOSIS.—*Umbellal Exogens, with a 2- or more-celled fruit without a double epigynous disk, tetramerous flowers, a valvate corolla, and opposite leaves without stipules.*

Trees or shrubs, seldom herbs. Leaves (except in one species) opposite, entire or toothed, with pinnate veins. Stipules 0. Flowers capitate, umbellate, or corymbose, naked or with an involucre, occasionally by abortion ♂ ♀. Sepals 4, superior. Petals 4, oblong, broad at the base, inserted into the top of the calyx, regular, valvate in æstivation. Stamens 4, inserted along with the petals and alternate with them; anthers ovate-oblong, 2-celled. Ovary adherent, 2- or perhaps 3-celled, crowned by a disk; ovules solitary, pendulous, anatropal; style filiform; stigma simple. Drupe berried, crowned by the remains of a calyx, with a 2-celled nucleus. Seeds pendulous, solitary. Embryo in the axis of fleshy albumen, and as long; radicle superior, shorter than the two oblong cotyledons.



Fig. DXVIII.

These plants were formerly confounded with Caprifoliæ, on account of the general resemblance between *Cornus* and *Viburnum*; they however represent an entirely distinct Order, as their habit and general characters sufficiently indicate. From Caprifoliæ their polypetalous structure removes them. To Witch Hazels they approach more nearly, but differ in the valvate æstivation of their corolla, &c. &c. In many respects Cornels resemble Loranths, from which they differ

among other things in the stamens being opposite to the sepals, and in the flowers being polypetalous. Hollyworts are sometimes compared with them, but they have a superior fruit and erect ovules. If Garryads were not amentaceous, and had petals and bisexual flowers, they would approach Cornels very nearly, and probably do in fact represent them in the diclinous sub-class, as seems to be proved by the genus *Pukateria*, whose flowers are ♂ ♀. To Umbellifers they also approach very closely, being chiefly distinguished by their tetramerous flowers, succulent fruit, and single style, to which may be added their opposite leaves. Such Cornels as *Cornus suecica* and *florida*, and *Benthamia* have the inflorescence and involucre of an Umbellifer. As to Ivyworts, it is hard to say in what manner they can be distinguished if we neglect the opposite leaves, the tendency to form a pair of cells in the fruit rather than a larger number, and, in fact, the tetramerous structure of the flower generally.

Found all over the temperate parts of Europe, Asia, and America. It is doubtful whether the African genera belong here.

The bark of *C. florida*, *sericea*, and *circinata*, is said to rank among the best tonics of North America, nothing having been found in the United States that so effectually answers the purposes of Peruvian bark in intermittent fevers. It is a remarkable fact that the young branches of *Cornus florida*, stripped of their bark and rubbed with their ends against the teeth, render them extremely white. From the bark of the fibrous roots the Indians extract a good scarlet colour. Lamp oil has been obtained from the seeds of *Cornus sanguinea*. The Cornus of the ancients was the present Cornelian Cherry (*Cornus mascula*), whose little clusters of yellow starry flowers stud its naked branches, and are among the earliest heralds of spring. Its fruit is like a small plum,

Fig. DXVIII.—*Benthamia japonica*.—Siebold. 1. a flower; 2. a perpendicular section of the pistil; 3. a head of fruit; 4. a section of a seed.







## ORDER CCXCIX. HAMAMELIDACEÆ.—WITCH-HAZELS.

Hamamelideæ, *R. Br. in Abel's Voyage to China*, (1818); *A. Richard Nouv. Étém.* 532. (1828); *DC. Prodr.* 4. 267. (1830); *Endl. Gen.* clxvii.; *Griffith in Asiatic Researches*, (1836), xix. p. 94.

**DIAGNOSIS.**—*Umbellal Exogens*, with a 2-celled not didymous fruit without a double epigynous disk, an imbricated corolla, alternate leaves with stipules, and anthers with deciduous *va ves*.

Small trees or shrubs. Their woody tubes, in some cases, marked by circular disks. Leaves alternate, deciduous, toothed, with veins running from the midrib straight to



Fig. DXIX.

the margin. Stipules deciduous. Flowers small, axillary, sometimes unisexual by abortion. Calyx adherent, in 4 or 5 pieces. Petals 4 or 5, or 0; if present, with an imbricated aestivation. Stamens 8, of which 4 are alternate with the petals; their anthers turned inwards, 2-celled, and 4 are sterile, and placed at the base of the petals; their dehiscence variable. Ovary 2-celled, inferior; ovules solitary or several, pendulous or suspended; styles 2. Fruit half inferior, capsular, usually opening with 2 septiferous valves. Seeds pendulous; embryo in the midst of fleshy horny albumen; radicle superior.

According to Brown, the affinity of Witch-hazels is on the one hand with Bruniads, from which they are distinguished by the insertion and dehiscence of the anthers, the monospermous cells of the ovary, the dehiscence of the capsule, the quadrifid calyx, and by habit; and on the other with Cornus, Marlea, and the neighbouring genera; in some respects also with Ivyworts, but differing in their capsular fruit, the structure of the anthers, and other marks.—See *Abel's Voyage, Appendix*. Mr. Griffith observed in *Bucklandia* and *Sedgwickia* that the woody tissue is marked with circular dots something like those of Conifers.

The species come from North America, Japan, China, and the central parts of Asia, Madagascar, and South Africa.

The kernels of *Hamamelis virginica* are oily and eatable. The leaves and bark are very astringent, and also contain a peculiar acrid essential oil.

The curious genus *Rhodoleia*, with great red involucre leaves, gives quite a new aspect to this Order, and points to an affinity of some kind with *Liquidambar* (see *Bentham in Bot. Mag. t. 4509*), as had indeed been pointed out by Griffith, who eventually reduced *Sedgwickia* itself to *Liquidambar* (see his report upon *Cantor's Collections*).

## GENERA.

I. HAMAMELEÆ.—  
Ovules solitary.

*Dicoryphe*, Thourars.  
*Dicorypha*, Spreng.

*Corylopsis*, Sieb. et Zucc.  
*Trichocladus*, Pers.  
*Dakidia*, Thunb.  
*Hamamelis*, Linn.  
*Trilopus*, Mitch.

*Loropetalum*, *R. Br.*  
*Parrotia*, *C. A. Mey.*  
*Fothergilla*, *Linn. f.*  
*Distylium*, *Zucc.*

? II. BUCKLANDEÆ.—  
Ovules several in each cell.

*Bucklandia*, *R. Br.*  
*Sedgwickia*, *Griff.*  
*Rhodoleia*, *Champion.*  
*Eustigma*, *Gardner.*  
*Tetracrypta*, *Gardner.*

NUMBERS. GEN. 13. Sp. ?

POSITION—Bruniaceæ.—HAMAMELIDACEÆ.—Cornaceæ.  
*Altingiaceæ.*

Fig. DXIX.—*Corylopsis*. 1. flowers; 2. branch in fruit; 3. a flower separate; 4. a stamen; 5. a perpendicular section of the ovary; 6. a section of a seed removed from the capsule and placed with the hilum downwards.







## ALLIANCE LVI. ASARALES.—THE ASARAL ALLIANCE.

DIAGNOSIS.—*Epigynous Exogens, with monochlamydeous flowers, and a small embryo, lying in a large quantity of albumen.*

The place which Birthworts should occupy in a Natural arrangement is one of those disputed points respecting which it is extremely difficult to arrive at any positive conclusion. They are so anomalous in their woody structure, and so peculiar in their trimmerous flowers, with an inferior ovary abounding in ovules, that an obvious ally can hardly be found for them. In fact they seem to be of an intermediate nature between Exogens and Endogens or Dietyogens. The great livid calyx of *Aristolochia* calls to mind the spathes of Arads: the leaves are those of Sarsaparillas. It is therefore probable that they should be regarded as a group standing on the borders of the three Sub-classes just mentioned, and joining them to each other, just as Switzerland joins Austria, Italy, and France.

The points of resemblance between Birthworts, Sandalworts, and Loranths are their want of corolla, their inferior ovary, their large albumen, and small embryo. These appear to be circumstances of greater weight than any distinctions that might be found between them. The rim which appears at the summit of the ovary of *Aristolochia* is possibly of the same nature as that of Loranths.

It is not to be wondered at that here—amidst Orders which, although apparently at the uttermost boundary of the vegetable kingdom, are really points of communication by means of which the circles of affinity return into themselves—we should find other tendencies than that of Birthworts to assume the condition of Natural Orders stationed in a lineal arrangement at very distant parts of the line. In truth, Sandalworts stand with respect to the Garryal Alliance, and Loranths to Amentals, in the same position as New Holland to New Zealand, or Kamtchatka to Russian America upon the maps; the whole world seems to divide them, and yet they are stationed within a few degrees of each other. Thus Loranths, which are often unisexual, approach Oleasters somewhat nearly, and Sandalworts come close up to the limits of Helwingiads.

## NATURAL ORDERS OF ASARALS.

<i>Ovary 1-celled. Ovules definite, with a coated nucleus . . .</i>	301. SANTALACEÆ.
<i>Ovary 1-celled. Ovules definite, with a naked nucleus . . .</i>	302. LORANTHACEÆ.
<i>Ovary 3-6-celled. Ovules 00. . . . .</i>	303. ARISTOLOCHIACEÆ.




## Oxidn. CCLL. SANT MACE E-200000000

[illegible]

Diagnosis.—*Ascaris* *Evansii*, with a length of only one eighth of an inch.

Trees or shrubs, sometimes with persistent or herbaceous plants. Leaves opposite, or nearly opposite, undivided, sometimes minute, and



Brown of London (*Phytologia*, 1833) had one of the most remarkable characters of this *Styrax* pointing in the inclination of the containing vessels, they are, but always a few, arranged in a row of 6 or 8, which are parallel, and attached to the centre of a central receptacle; this receptacle happens to be larger in the different genera, in some being broader, so as to cover nearly the cavity of the ovary. In *S. latifolia* (Lamour.) the ovules are erect, as Gmelin observed, and they are inserted the same in *Ostrya*, which I described in Vol. 1, p. 10. The same relationship of *Saurauia* is a singular quality. The *Entonia* is ascribed to the neighbourhood of *Podocarpus* in Oenothera; but this inference, founded on a supposed participation, disagrees with both their structure and their bearing; the flowers also divide them from *Myrica*. *Entonia* is a native of

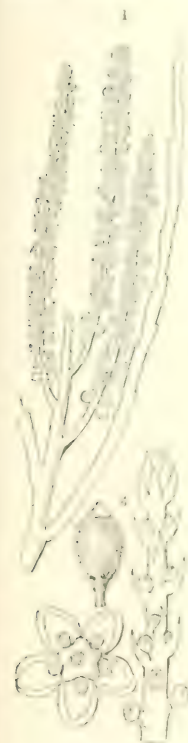


Fig. DNAL.



1. DONNO

The species are found in Europe and North America, at the foot of trees, between weeds; in New Holland, the East Indies, and the South Sea Islands, growing climbing on small trees.

Sandal-wood is the produce of *Santalum album*: it is highly recommended by the doctors as possessing sedative and cooling qualities, and as a remedy in febrile and gonorrhoea. It is also employed as a perfume. The wood of the tree which grows in the Islands is the wood of *Santalum Indicum* and *Santalum*. The *Santalum* of Osiris *nepalensis* form a sort of tea. An infusion of Mysore sandal-wood is used by the

Fig. DXXXI.—*Thesum pratense*. 4. Placenta and pair of exiles.  $\times 100$ .



Chilenos, is purgative. The fruit of the Quandang Nut (*Fusanus acuminatus*) is as sweet and useful to the New Hollanders as Almonds are to us ; that of *Cervantesia tomentosa* has a similar reputation in Peru. Oil is obtained in Carolina from the kernels of *Pyrularia pubera*. *Leptomeria Billardieri*, a common Tasmanian shrub resembling the European Broom in its green and almost leafless habit, is acid in almost every part, especially in the fruit, but astringent also, and is well suited, when chewed, to allay thirst.—*Backhouse*. The *Thesiums* are scentless and slightly astringent.—*DC*.

# GENERA.

Quinchamalium, <i>Juss.</i>	<i>Balnerdia</i> , <i>Commers.</i>	<i>Osyris</i> , <i>Linn.</i>	<i>Pyrularia</i> , <i>L. C. Rich.</i>
Arjoona, <i>Cav.</i>	<i>Choretrum</i> , <i>R. Br.</i>	<i>Casia</i> , <i>Tourn.</i>	<i>Hamiltonia</i> , <i>Mühlenb.</i>
<i>Thesium</i> , <i>Linn.</i>	<i>Leptomeria</i> , <i>R. Br.</i>	<i>Sphærocarya</i> , <i>Wall.</i>	<i>Calinux</i> , <i>Raf.</i>
<i>Alchimilla</i> , <i>Tournef.</i>	<i>Comandra</i> , <i>Nutt.</i>	<i>Scleropyron</i> , <i>Arn.</i>	<i>Cervantesia</i> , <i>Ruiz et Pav.</i>
<i>Thesiumyris</i> , <i>Rehb.</i>	<i>Fusanus</i> , <i>Linn.</i>	<i>Santalum</i> , <i>Linn.</i>	<i>Myoschilos</i> , <i>Ruiz et Pav.</i>
<i>Frisea</i> , <i>Reichenb.</i>	<i>Colpoon</i> , <i>Berg.</i>	<i>Sirium</i> , <i>Linn.</i>	
<i>Rhinostegia</i> , <i>Turcz.</i>	<i>Eucarya</i> , <i>Mitch.</i>	<i>Mida</i> , <i>A. Cumingh.</i>	<i>Octarillum</i> , <i>Lour.</i>
<i>Nanodea</i> , <i>Banks.</i>			

NUMBERS. GEN. 18. Sp. 110.

*Olacacæ.*

POSITION.—*Loranthacæ.*—SANTALACEÆ.—*Aristolochiacæ.*

*Thymelacæ.*

# ADDITIONAL GENERA.

? *Darbya*, *A. Gr.*

|

? *Modeceopsis*, *Griff.*



## Order: CCCII. LORANTHACEAE. 1.

*Foranthea*, *Jace et Rich*, *Ann. Mus. Nat. Hist. Nat.*, 4<sup>th</sup> Série, 4<sup>th</sup> Volume, 1891, page 3.  
*Jace* - *Vibrona*, *Rich*, *Ann. Mus. Nat. Hist. Nat.*, 4<sup>th</sup> Série, 4<sup>th</sup> Volume, 1891, page 3.  
*Wright*, *Illustr.*, 2, 6, 11. *Alph. Jace*, *Ann. Mus. Nat. Hist. Nat.*, 4<sup>th</sup> Série, 4<sup>th</sup> Volume, 1891, page 3.

DIAGNOSIS.—*Astral Euposa*, with a *Antennal* *Euposa*.

Shrubby plants, in almost all cases growing into the trees of other vegetation as parasites. Leaves opposite, or sometimes alternately, venous, 2-lobed, venous, serrated.



PL. DXXXIII.

[illegible]

It is customary to call the floral envelopes of the genus of *Viscum* the calyx and sepals in *Viscum*, and of petals in *Loranthus*, because in the former genus the floral envelope to them a cup-like expansion, which is regarded as a calyx. It however is not possible to doubt that the parts of the perianth are really of the same origin in both instances, as is proved moreover by the structure, which we regard as that of the calyx cases. Schleiden, indeed, calls the ♂ flower of *Viscum* male and the ♀ flower consist of nothing but anthers: but M. De AMOR has been nothing more than a few

\* Schleiden has taken a very different view of the structure of *Phragmites*. He has shown that the so-called 'truly naked outside' is surrounded by a 'true cuticle' consisting of a 'true cuticle' and a 'true cuticle' and consisting of a naked nucleus. (Schleiden, 1858, p. 107)



of that genus to consist of 4 anthers grown to the inner face of 4 calycine sepals. The rim exterior to the calyx, which has given rise to the idea that the coloured part of a Loranthis is corolla, is present in *Viscum* also, in the form of a slight annular swelling; and is in all probability analogous to the raised line terminating the cup, from the rim of which the sepals spring in *Chryseis* or *Eschscholtzia*. In fact, we must in theory regard the flower of a Loranthis to consist of a fleshy cup-like expansion of the end of a branch, from the upper edge of which expansion the sepals rise. This point being settled, we then have no difficulty in admitting the near alliance of Loranthis and Sandalworts; a fact not lost sight of by Dr. Brown in his *Prodromus*; he also, in speaking of his *Myzodendrea*, or feathered Loranthis, again adverts to the resemblance between their three ovules suspended from the apex of a central placenta, and the same part in Sandalworts.—*Linn. Trans.* xix. 232. Decaisne too, recognises their apetalous condition, and refers them to the neighbourhood of Sandalworts. They may also be looked upon as having considerable analogy with Proteads, which must be considered to occupy a place in the perigynous sub-class parallel with that of Loranthis in the epigynous. The occasional separation of the ♂ and ♀ in different flowers points strongly to a relation to some diclinous Order, which relation seems to be found in Helwingiads. See p. 296.

In some respects this singular Order offers very curious deviations from the ordinary structure of similar plants. The wood of *Viscum* is described by Decaisne as consisting, when young, of eight woody bundles surrounding a green pith; in these bundles are no spiral vessels, but instead, and nearly in the place where they are usually found, some ringed tubes; these, together with elongated and dotted or reticulated cells and fibres analogous to those of the liber, make up all the longitudinal tissue of the plant. On the outside of these bundles of woody matter, and opposite to them, are found others, similar in number but smaller, and composed exclusively of fibres of the liber.—*Mémoire sur le Développement du Gui*. Brown states that in *Myzodendron* the whole woody tissue consists of ladder-shaped vessels (v. scalariformia), a structure very different from that of other genera of Loranthis.

In the genus *Viscum* the anther forms its pollen in a number of distinct cavities, in the same way as in *Ægiceras*; this has been beautifully illustrated by Decaisne, (*Acad. Roy. Brux. XIII. t. 1.*)

The production of the ovules and their fertilisation is attended with some of the most curious phenomena known in the vegetable kingdom, not the least of which is that in *Viscum* the ovule does not appear till three months after the pollen has exercised its influence; and another, that the young ovules sometimes become consolidated, the result of which is the presence of two or more diverging embryos in the same seed. See M.

Decaisne's Memoir above quoted, and also that of Griffith, *On the Development of the Ovules of Loranthis and Viscum*, in the *Linnean Transactions*, vol. xviii. p. 71, for many other important particulars.

The nature of the parasitism of these plants is very curious, and has been most carefully described by Griffith. He states that in Loranthis the ripe seeds adhere firmly to the substance on which they are applied, by means

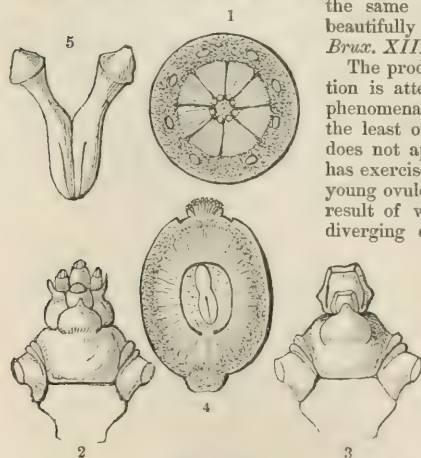


Fig. DXXIV.

of their viscid coating, which hardens into a transparent glue. In two or three days after application, the radicle curves towards its support, and as soon as it reaches it becomes enlarged and flattened. By degrees a union is formed between the woody system of the parasite and stock, after which the former lies exclusively on the latter, the fibres of the sucker-like root of the parasite expanding on the wood of the support "in the form of a pâte d'oe." Prior to that time the parasite had been nourished by its own albumen, which is gradually absorbed. "As soon as the young parasite has acquired the height of one or two inches, when an additional supply of nourishment is perhaps required, a lateral shoot is sent out, which is, especially towards the point, of a green

Fig. DXXIV.—*Viscum album*. 1. a cross section of the stem (Decaisne); 2. ♀ flowers; 3. ♂ flowers (Schleiden); 4. the fruit cut perpendicularly; 5. a pair of embryos united where they come in contact (Decaisne).



colour. Thus at one, or two, and independently of various points of view, to see regularly by means of needles and microscopes, which are primarily used in dissection and study of attachment to the cellular network. The extent of the process is not extending beyond their original attachment, so that the new branching points continue only to a considerable distance, every place being finally covered by parasites, and all that have originated from one point. "I have seen," says Mr. Graham, "many instances that have taken their entire growth in a single branch, having expanded, and going to fruit, and I may express it, as a point capable of affecting some individuals." The growth of *Loranthus* are not confined to branches or twigs. Mr. Graham says some of them having seized upon the leaf of a trifoliate plant, and two branches sprouted at the base. Although not unlike plants, yet they still remain in the same position as such as are so, as for example, on the *Jas* (*Acacia*), *Acacia*, *Acacia*, *Acacia*, it is obvious that they must have an ascending power, and this is confirmed by the report of Chemists, who assume that the wood of the *Wistaria* when parasitized by *Loranthus* is found to contain twice as much protein, and five times as much glucose, and in the wood of the foster tree. This is the same process which we find in some trees rapidly some *Loranthus* not away from their parent branch, playing a role, having cellular matter of the before in the form of long, forward and solid growth, and embracing the parasite and hold it fast in its place. Forgetting that the growth of this kind of growth have been brought to the *Wistaria* (*Wistaria*) by Mr. Graham.

See Datserlet, Sae, & Morimoto for more on this argument and discussion.

The Order seems to be equally common through the tropical regions of Asia and America; but on the continent of Africa to be much more rare, only 2 having been yet described from equinoctial Africa, and 1 from the East of Great Britain. Two are native from the South Seas, and 1 from Java (Banks); the other 2 require, no doubt, to be largely increased. Thus only one from Europe, *Sesuvium floribunda*, a beautiful shrub, with very large thyrses of bright magenta-colored flowers, is a singular instance of a plant of this peculiar Order growing here in Britain. And such is the abundance of the corresponding members, that the village of King George's Sound compares it to a tree, as they do here, I have given the name of Fire-tree. A second species (*S. frutescens*, A. DC.) was found by Mr. Cunningham in 1847 in the more arid parts of the Blue Mountains near the Fort St. George.

The bark is usually serrated, as in the *Martius* of our trees. The surface within a viscid matter like ferrugine, which is soluble in water well diluted. The most remarkable quality that *Hamelia* possesses, however, is the power of staining the wood of other plants, at which expense they live. The bark of the common *Mimus* gives an idea of that of all, except that in the green branches the surface is more and often richly coloured. In the same they are of small account, the *Hamelia* of the Oak, consecrated by Druidical superstitions, was the common *Hamelia* of the *Hamelia*, thus *Hamelia* is used for dyeing black in China and some of the best of the Brazilian medicine as poultices, and even the antiquaries, they very much of a little moment, that *Martius* scarcely notice them in the *Hamelia* *Mimus* *Mimus*.

## GENERAL

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November 1, 1997

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Volume 10



Mr. Miers, who has carefully studied this Order, thinks, with much reason, that *Viscum* and *Loranthus* ought not to be associated, as is usually done, and separates them as follows :—

## LORANTHACEÆ.

"Suffruticose plants, in most cases growing into the tissue of other vegetables, as true parasites, often simply epiphytical, and sometimes terrestrial shrubs. Leaves opposite or alternate, entire, veinless, fleshy, without stipules. Flowers ♂, axillary or terminal, corymbose, cymose, rarely umbellate or capitate. Calyx tubular, adnate, margin free and entire, frequently springing from a series of successive cup-shaped bracts. Petals 4-8, often 5 or 6, linear, frequently of great length, and of brilliant colours, valvate in æstivation, quite free, sometimes slightly agglutinated at base, insertion epigynous. Stamens equal in number and opposite to petals, to which they are partially adnate at base; anthers introrse 2-lobed, basifixed or adnate and erect, sometimes incumbent and versatile, bursting by 2 longitudinal fissures: pollen flat, 3-lobed, with 3 radiating lines. Ovary always inferior, 1-locular: ovule solitary suspended from the summit of the cell. Style filiform. Stigma simple, sub-capitate. Fruit drupaceous, ovoid, fleshy or glutinous, crowned by a circular scar or by the persistent rim of the calyx, and partly imbedded below in its bractiform cup, 1-locular, monospermous, containing a subcoriaceous putamen, crowned by a short membranaceous cap, from the summit of which the solitary exsutive seed is suspended, so that this appears as if it were partly exserted; embryo enclosed in thin, almost pellicular

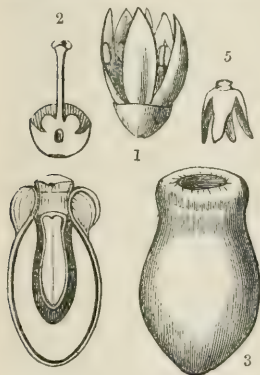


Fig. DXXIV, bis.

cap, from the summit of which the solitary exsutive seed is suspended, so that this appears as if it were partly exserted; embryo enclosed in thin, almost pellicular

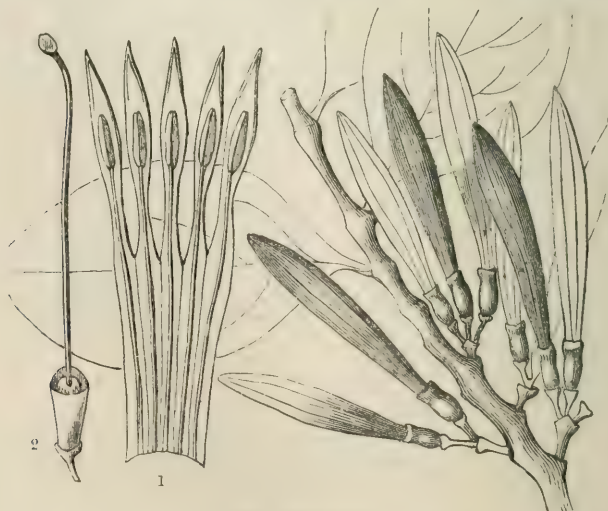


Fig. DXXIV, ter.

albumen, filling the cell; radicle short, subterete or discoidal, superior, and therefore next the hilum, with 2 to 4 large, semiterete, fleshy cotyledons.

Fig. DXXIV, bis.—Details of the fructification of *Struthanthus*. 1. flower magnified; 2. section of calyx, ovary, and style; 3. fruit invested by the adnate calyx; 4. section of ditto after the calyx is removed; 5. an embryo with 4 cotyledons—after sketches by Mr. Miers.

Fig. DXXIV, ter.—*Loranthus memecylifolius*. 1. corolla laid open; 2. ovary, &c.,—after sketches by Mr. Miers.



The association of *Viscum* with *Loranthus* has led most botanists to believe, give the real structure and others the true affinities of two genera, as it were, seen from the following differential characters. Both genera, however, in fact, present offer any points of resemblance. *Loranthus* is distinguished by generally very showy, crimson, dichlamydeous, hermaphrodite flowers, with long slender stamens and an ovary containing a solitary ovule, suspended from the summit of the cell; the embryo of the seed, developed in a thin portion of albumen and cavity, having a small, superior, directed radicle, with large, fleshy cotyledons. *Viscum*, on the contrary, has small, pallid, tubular, monochlamydeous flowers with stamens sessile, or nearly so, quite different in structure from *Loranthus* pollen, an unilocular turbinate ovarium, possessing a central placenta, and a very short free central placenta, of these only our genus becomes particularly worthy its growth, of course, such as occurs in exact position. The fruit is a very small glutinous fleshy pulp, covering a membranaceous pericarp, forming a spherical nucleus, seated in the bottom of the cell, and of about the size of the embryo. This consists of a mass of fleshy albumen, heart-shaped, with a rather dense outer coat, with a flattened apical sinus, the summit being in some degree protracted and covered by a thin pellicular extension of the albumen, or embryo-sac. The radicle is always directed and therefore averse from the hilum, and the minutely slender and broad cotyledons lie in the bottom of the cavity, formed in the lower part of the glutinous mass of the nucleus. The affinity of *Viscum* is illustrated almost best by the Santalaceæ, and the Loranthaceæ must occupy a very distinct position in the system. By most botanists this family has been placed near *Chastilleaceæ*, where we suggested the Cornaceæ (including *Moræa*), *Ardisiaceæ*, and *Hamamelidaceæ*, but these have all plurilocular ovaries. *Akrogonia*, as suggested by Dr. Walp. seems to approach nearer in its structure, with its adaxial ovule, sessile petals with simple aestivation, adnate anthers, large exserted polyandrous stamens, single style, turbinate ovary, with a single ovule suspended from its summit, the ovum containing the seed suspended, having an orthotropical embryo, directed by albumen, rudimentary radicle, and large cotyledons. To these may be added its alternate, frequently punctate leaves, and axillary flowers. The true affinities of this genus having been said to be yet satisfactorily established. Their relation to *Viscum* has been suggested by Mr. Brown (*Phodæ*, 540), but these resemblances in the structure of the flowers are perhaps more apparent than real, while the general aspect of the young is extremely at variance with this supposition. Herndon has long since been mistaken in their conclusions in regard to the affinities of *Viscum* in the remarks given of the structure of its seed by *Christner* (*Phodæ*, 7, p. 144, vol. 27). Dr. Brown, always accurate in his dissections, is often in error in his conclusions. According to this excellent carpologist, the fruit consists of a hard, thick, bony pericarp, and a soft fleshy mesocarp, which, without interfering with the bony pericarp, what he conceives to be a copiously glutinous seed. This is a possibility, what he designates as the albumen is in reality the pericarp, consisting of a very hard and coriaceous, its true nature being proved by the presence of the numerous of as many nourishing threads as there are grains in the seed, besides the presence of the thin plate of true granular albumen, which is not even present, having entirely escaped his observation. The pericarp is as in *Malva*, and is covered by a soft membranaceous neck or mesocarp, which is not a true pericarp, but its mouth like the sealed neck of a bottle; this neck does not burst naturally, and is attached firmly beneath the persistent spherical, yellow, persistent of the protruded with it, by the expansion of the pericarp, and the neck of the seed never becomes imbricated, being surrounded by a coat, with 4 yellow, green trachea-like threads, which turn a pulvinate mass, covered by a thin, yellow, smooth and soft. This curious design for imbricating the young development of the embryo, and its easy protrusion from the point of its insertion in *Loranthus* seems very analogous to what we find in *Viscum*, *Myrsine*, and other truly parasitic genera, where a development that answers the same purpose, is seen, and the result of the albumen showing how admirably Nature, under various forms of structure, provides analogous contrivances for the performance of similar functions.



## VISCACEÆ.

"Viscoideæ, *Rich. Ann. dufr.* 33. (1818); Myzodendree, *R. Br. Linn. Trans.* 19, p. 232. (1844); Viscaceæ, *Miers Ann. Nat. His., 2nd. ser.* 8, p. 179. (1851).

"Parasitical evergreen shrubby plants dichotomously ramose. Leaves opposite, fleshy, veinless, entire. Flowers minute, diœcious or monœcious, generally imbedded in decussate pairs in fleshy axillary spikelets. Calyx confounded with the corolla, in a greenish-coloured perigonium, tube urceolate, adnate to the ovary, with 3 to 5 fleshy, triangular, free, patent lobes, valvate and depressed in æstivation: disk epigynous, flat or cup-shaped, adnate to perigonium, with 3 to 5 short, rounded, free lobes, which are alternate with the segments of the perigonium. Stamens equal in number and opposite to segments of the perigonium, almost sessile, inserted on outside of disk between its lobes. Ovary 1-celled, with 3 ovules suspended from a free central placenta. Berry drupaceous, 1-seeded; pericarp membranaceous, enveloped in fleshy viscous juice: seed solitary, erect, naked; albumen large, fleshy, heart-shaped, with a small embryo half imbedded in emarginate summit of albumen, the exerted portion covered with a mammæform embryotega, which is an extension of the albumen: radicle large, subterete, superior,

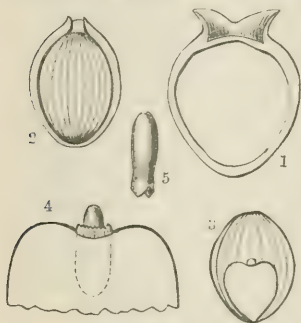


Fig. DXXIV. quater.

partly exerted, cotyledons very minute, wholly imbedded in the albumen.

"The affinity of the Viscaceæ is decidedly with Santalaceæ, with which they agree in their monochlamydeous flowers, with the stamens placed opposite the segments of the border, which have a valvate æstivation: the tube of the perigonium is adnate with the ovarium, as well as with the epigynous fleshy cup-shaped disk, the lobes of which are free and alternate with the stamens and the segments of the perigonium: the ovary is unilocular, with 3 ovules suspended from a free central placenta, one ovule only arriving at maturity, and this ripens into an exutive albuminous seed. In all these points they resemble that family, but they differ in their entirely parasitical habit, their opposite leaves, their mode of inflorescence, their diœcious flowers, also in their floral and carpellary envelopes being charged with viscoferous tracheæ, and in the form of the embryo, which is only partly immersed in the solid body of the albumen. The structure of the anthers is likewise very peculiar; in *Viscum*, these are equal in size, and completely adnate to the segments of the perianth, and the pollen is contained in a number of distinct cells arranged like a network over its surface; in *Arceuthobium* and in *Myzodendron* they are unilocular, bursting by a small apical transverse fissure; in *Phoradendron* they are 2-locular, discharging their pollen by 2 apical pores, as in *Choretrum*, and the walls are thick and crustaceous.

"Korthals first detected the fact of the existence of distinct ovules, suspended upon a free central placenta, in the ovarium of two Javanese species, that he erroneously referred to *Tupeia*, which he considered, on this account, to belong to Santalaceæ. Mr. Brown was the foremost in pointing out the resemblance in this respect of the structure of *Myzodendron* to the Santalaceæ. M. Decaisne also confirmed the existence of the same fact in the ovary of *Viscum album*, and this structure in *Myzodendron* was beautifully illustrated by Dr. Hooker in his *Flora Antarctica*, thus proving demonstratively the affinity of this genus towards the Santalaceæ and Olacaceæ: the embryo is there shown to be imbedded in a deep vacuity in the summit of a large albuminous mass, and partly exerted and covered over by a thin embryotega, or extension of the albumen (*Plate 104, figs. 19 & 20*). This the writer of these notes finds conspicuous in *Phoradendron*, where the opercular membrane bears considerable analogy with the singular mammiform protrusion seen in the albumen of *Commelyna* and *Tradescantia*, called embryotega by Gaertner, and operculum by Mirbel. We have sufficient evidence of the same structure in *Viscum album*, from the clear details of the development of the seed and embryo, by Richard, in Jussieu's memoir on that genus (*Ann. Mus. XII., tab. 27*). But notwith-

Fig. DXXIV. quater.—Details of a *Phoradendron*. 1. fruit, with half the calyx removed; 2. endocarp, with half the pericarp removed; 3. kernel, with half the endocarp removed; 4. upper end of kernel, showing the exerted embryo; 5. embryo separate.



standing the analogy is referred to this partial absorption of the secondary in determining the phenomena in the latter case will be found to be very different. *Viscum album* is referred to a more perfect absorption of equal kinds, but necessarily involves all parts of the analogy, which place it rather distant from the two other cases of the genus.

The mission is supposed to be propagated by birds, separating the filillary and through, which feed on the leaves. The seeds passing through them, are found. The mode in which the propagation of *Myrsine* is effected, is equally interesting, as related by Dr. Hooker (*Flora Antarctica*, vol. II. p. 261); being that track is not traced but the seeds are provided with long filillary processes, situated by the perianth. Composites, which serve to float them in the sea, and afterwards, in letting them on to the branches, until the bodies of animals or manures shall reach the plant, which is to serve as its future support. The manner in which this effect is beautifully described in that work (*Flora ant. p. 261*).

*Viscum album*, the if of the genus was thought to possess general medicinal virtues, and obtained much reputation through the influence of the late emperor of epilepsy. Its efficacy was believed to be total, later than in the case of other remarkable instances of its cure and many subsequent healing without attest its efficacy in convulsive disorders, and it has since been very common that its name has been long ago expunged from the catalogue of the Medical Writers. The leaves and berries have little smell, though they have a weak bitterness, the aqueous extracts are bitter and somewhat saline and the spiritual extracts have great astringency, and those of the berries intense bitterness; the latter almost too extremely tenacious and unpleasantly sweet, avoiding from which, however it is treated, which is insoluble in water or alcohol. The mandibles of the silk mentioned by Linnaeus upon it, especially in the middle of the page from the *Viscum album*, which to this day remains an well-known illustration, with the same time.

The genera of the order are mostly like in respect of species and of local distribution. *Viscum*, and *Asarabacum* being confined to Europe; *Myrsine* and *Lepidosorus* to the southernmost parts of Asia; *Delonchium* to the banks of the river Uruguay; *Phoradendron* seems to be universally common to species, and to be extremely abundant over the tropical zone and distributed sparingly over the southern temperate regions of both the old and new worlds.

#### GENERA.

*Viscum*, Thunberg.  
*Asarabacum*, Ait.  
*Delonchium*, HBK.  
(*Castanea*, n. 261.)

*Myrsine*, L.  
*Myrsine*, Ait.  
*Phoradendron*, HBK.

*Phoradendron*, Thunberg.  
*Phoradendron*, Ait.  
*Phoradendron*, HBK.

#### SYNOPSIS. GEN. 1. 2. 3.

PARTS. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 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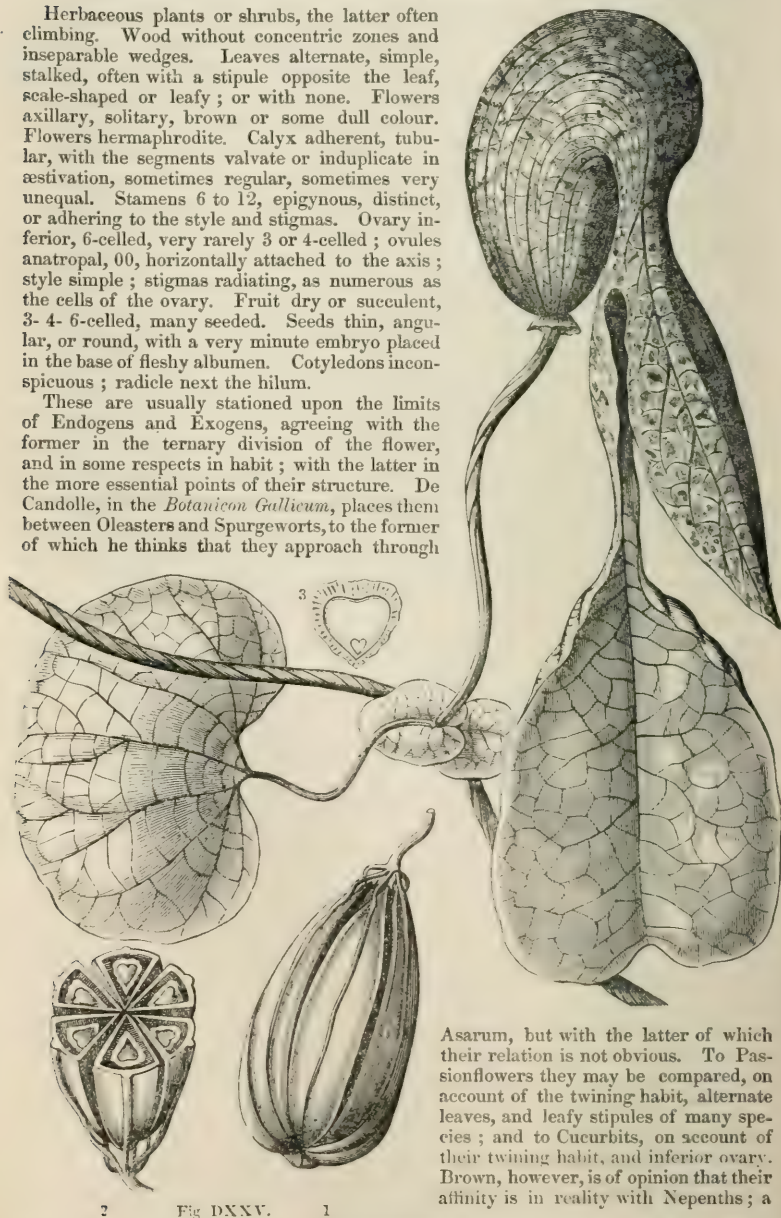
## ORDER CCCIII. ARISTOLOCHIACEÆ.—BIRTHWORTS.

*Aristolochia*, Juss. Gen. (1789) ; *R. Brown Prodr.* 349 ; *Endl. Gen.* cxiv. ; *Horsfield Pl. Jav.* p. 43.—*Pistolochinæ* and *Asarinæ*, *Link Handb.* 1. 367. (1829).—*Asarinæ*, *Bartl. Ord. Nat.* 81. (1830)

DIAGNOSIS.—*Asaral Exogens*, with a 3-6-celled ovary and 00 orules.

Herbaceous plants or shrubs, the latter often climbing. Wood without concentric zones and inseparable wedges. Leaves alternate, simple, stalked, often with a stipule opposite the leaf, scale-shaped or leafy ; or with none. Flowers axillary, solitary, brown or some dull colour. Flowers hermaphrodite. Calyx adherent, tubular, with the segments valvate or induplicate in aestivation, sometimes regular, sometimes very unequal. Stamens 6 to 12, epigynous, distinct, or adhering to the style and stigmas. Ovary inferior, 6-celled, very rarely 3 or 4-celled ; ovules anatropal, 00, horizontally attached to the axis ; style simple ; stigmas radiating, as numerous as the cells of the ovary. Fruit dry or succulent, 3-4-6-celled, many seeded. Seeds thin, angular, or round, with a very minute embryo placed in the base of fleshy albumen. Cotyledons inconspicuous ; radicle next the hilum.

These are usually stationed upon the limits of Endogens and Exogens, agreeing with the former in the ternary division of the flower, and in some respects in habit ; with the latter in the more essential points of their structure. De Candolle, in the *Botanicon Gallicum*, places them between Oleasters and Spurge-worts, to the former of which he thinks that they approach through



*Asarum*, but with the latter of which their relation is not obvious. To *Passiflora* flowers they may be compared, on account of the twining habit, alternate leaves, and leafy stipules of many species ; and to *Cucurbit*s, on account of their twining habit, and inferior ovary. Brown, however, is of opinion that their affinity is in reality with *Nepenthes* ; a

Fig. DXXV.—*Aristolochia galeata*.—*Martius*. 1. fruit of an *Aristolochia* ; 2. cross section of it ; 3. half its seed.



view adopted by Eichler, to most *Convolv.*, and *Utriculariæ*. I confine myself to a more attentive study of the Order, and its affinities, but grow more and more convinced that I cannot but consider that (these) can very strongly be referred to the same group. Birthworts and other plants. Eichler compares them, with some justice, to Yams and *Convolv.*, but they are most certainly distinct. Their respiratory tissue, structure and mesophyllous formed wood indicate, however, a strong tendency towards the condition of *Dietyogens*, and perhaps they may be looked upon as the last point of transition to that class from *Exogens*. It is in some measure on that account that they have been placed in this arrangement last in the whole series, and therefore at a point where we may suppose that the chain of Orders must return into itself. If their association with *Sandalworts* and *Loranthis* should be objected to, I would submit that the correspondence of these Orders in their epigynous apetalous flowers, and minute embryo in copious albumen, are circumstances of agreement of no mean importance, and that it is at present impossible to discover any better station for either of the three Orders.

Very common in the equinoctial parts of South America, and rare in other countries; found sparingly in North America, Europe, and Siberia; more frequently in the basin of the Mediterranean, and in small numbers in India.

Birthworts are in general tonic and stimulating; *Aristolochia*, as its name implies, considered emmenagogue, especially the European species *rotunda*, *longa*, and *Clematitis*. An infusion of the dried leaves of *Aristolochia* *Americana*, is recommended as an antivenereal; really binding and mixed with castor oil, they are considered as a valuable remedy in chlostric pains. The root of *A. indica* is supposed by the Hindus to possess emmenagogue and abortifacient virtues; it is very bitter. The *A. fragrans*, called *Yerva*, *Banana*, or *Estrella*, or *Star Root*, is highly esteemed in Peru as a remedy against the malignant inflammatory fevers, colds, rheumatic pains, &c. This root is the best root. The power of the root of *A. serpentaria* in arresting the progress of the same fevers, or typhus, is highly spoken of by Barton; it has an aromatic smell, resembling that of *Valerian*, with a warm, bitterish, pungent taste. It acts as a powerful antispasmodic, cathartic, and in certain cases as an antipneustic anodyne. It is particularly useful in supporting the strength and in arresting the progress of those fevers which attack great constitutional debility. Dr. Chapman considers it "extremely useful in all vomiting, well to tranquillize the stomach, more particularly in bilious cases." As its leaves contain a small as an antidote to serpent bites, a species in which several other species participate, among which may be mentioned the *A. triflora*, a Japanese plant, also employed as a pectoral and powerful sudorific, and the *Carthagenia A. nigrifolia*, mentioned which Jacquin writes, that the juice of the root chewed and swallowed upon the death of a person stupefies it that it may for a long time be retained with impunity. If the species be



ARISTOLOCHIA

Fig. DXXVI.—*Aristolochia indica*. 1. portion of the root; 2. portion of the root, showing the internal structure; 3. stamen; 4. pistil, the same divided perpendicularly; 5. another kind of flower.



pelled to swallow a few drops it perishes in convulsions. The root is also reputed to be an antidote to serpent-bites. This plant is probably the celebrated Guaco of the Colombians, concerning whose supposed efficacy as an alexipharmic, so much has been said by Humboldt and others: at least a leaf of what is either this species, or one closely allied to it, has been given me by Dr. Hancock as the genuine Guaco. It is not a little remarkable that the power of stupifying snakes, ascribed in Carthagenæ to *A. anguicida*, should be also attributed to *A. pallida*, *longa*, *boetica*, *sempervirens*, and *rotunda*, which are said to be the plants with which the Egyptian jugglers stupify the snakes they play with. In medicine these plants are slightly aromatic stimulating tonics, useful in the latter stages of low fever; the taste is bitter and acrid; the odour strong and disagreeable; they are said to be sudorific, and have been employed as emmenagogues in amenorrhœa.

The stimulating qualities of Birthworts seem to reach their maximum in *A. cymbifera*, *labiosa*, *ringens*, *galeata*, and *macroura*, Brazilian species, whose roots have a very penetrating, disagreeable smell, like that of Rue, and a strong, bitter, aromatic taste, producing almost entirely the same effects as the Virginia snake-root (*A. serpentaria*). They are very frequently used in Brazil against ulcers, paralytic affections of the extremities, dyspepsy, impotentia virilis, in nervous and intermittent fevers, especially those in which a predominant disorder of the pituitous membrane, or the whole lymphatic system has been observed. *A. grandiflora*, a fœtid Jamaica species, is said by Swartz to be poisonous to hogs. For the qualities of other species see *Martius Mat. Med. Bras.* 107. One of the Asarabaccas, or Asarums, is analogous in its action, viz. *A. canadense*, which is a warm aromatic stimulant and diaphoretic; but *A. europæum* is said to be purgative, emetic, and diuretic; it is called Cabaret in France, because, as it is said, the frequenters of pot-houses use it to produce vomiting. *Bragantia tomentosa*, an intensely bitter plant, is used in Java as an emmenagogue, according to Horsfield.

#### GENERA.

<i>Asarum</i> , Tournef.	<i>Sipho</i> , Endl.	<i>Einomenia</i> , Raf.	<i>Munickia</i> , Reichenb.
<i>Heterotropa</i> , Decaisne.	<i>Hocquartia</i> , Dumort.	<i>Endodaca</i> , Raf.	<i>Apama</i> , Lam.
<i>Aristolochia</i> , Tournef.	<i>Siphisia</i> , Raf.	<i>Isotrema</i> , Raf.	<i>Trimeriza</i> , Lindl.
<i>Clematitis</i> , Endl.	<i>Siphonolochia</i> , Reich.	<i>Niphus</i> , Raf.	<i>Asiphonia</i> , Griff.
<i>Glossula</i> , Raf.	<i>Cardiolochia</i> , Raf.	<i>Bragantia</i> , Lour.	<i>Thottea</i> , Rottb.
<i>Serpentaria</i> , Raf.	<i>Guaco</i> , Liebm.	<i>Ceranium</i> , Blum.	<i>Trichopodium</i> , Lindl.
<i>Pistolochia</i> , Raf.	<i>Dictyanthes</i> , Raf.	<i>Vanhallia</i> , Schult. f.	<i>Trichopus</i> , Gärtn.

NUMBERS. GEN. 8. Sp. 130.

*Nepenthaceæ*? ?

POSITION.—*Santalaceæ*.—*ARISTOLOCHIACEÆ*.—*Loranthaceæ*  
*Dioscoreaceæ*.

#### ADDITIONAL GENERA.

*Lobbia*, Planchon.

| *Strakæa*, Presl. = *Bragantia*.











## ESTIMATED NUMBER OF GENERA AND SPECIES

(187)

## THE VEGETABLE KINGDOM.

IN THE MOUNTAINS OF INDIA.

★

Class I. <i>Tracheophytes</i> .		Class II. <i>Angiosperms</i> .		Class III. <i>Rhizomorphs</i> .		Class IV. <i>Endogens</i> .	
Alliance I. <i>Alismas</i> .		Alliance IV. <i>Moraceae</i> .		Alliance VII. <i>Graminifera</i> .		Alliance VIII. <i>Graminifera</i> .	
Order 1. <i>Diatryaceae</i> , 17	40-45	Order 15. <i>Riceaceae</i> , 27	10-20	Order 29. <i>Graminifera</i> , 103	241-250	Order 29. <i>Graminifera</i> , 103	241-250
— 2. <i>Cyperaceae</i> , 14	60-65	— 16. <i>Martyniaceae</i> , 28	15-20	— 30. <i>Cyperaceae</i> , 117	110-120	— 30. <i>Cyperaceae</i> , 117	110-120
— 3. <i>Funariaceae</i> , 20	80-100	— 17. <i>Juncaceae</i> , 20	10-20	— 31. <i>Dioscoreaceae</i> , 120	40-45	— 31. <i>Dioscoreaceae</i> , 120	40-45
— 4. <i>Commelinaceae</i> , 23	80-90	— 18. <i>Euphorbiaceae</i> , 40	1-10	— 32. <i>Rubiaceae</i> , 121	20-191	— 32. <i>Rubiaceae</i> , 121	20-191
— 5. <i>Chloraceae</i> , 25	70-80	— 19. <i>Anthriscaceae</i> , 65	1-10	— 33. <i>Eriocaulaceae</i> , 122	20-200	— 33. <i>Eriocaulaceae</i> , 122	20-200
	250-300	— 20. <i>Dryaceae</i> , 64	14-110				
Alliance II. <i>Funariaceae</i> .		Alliance V. <i>Lycopodiaceae</i> .		Alliance III. <i>Liliaceae</i> .		Alliance VI. <i>Funariaceae</i> .	
Order 6. <i>Asplundaceae</i>	10-20	Order 21. <i>Lycopodiaceae</i> , 60	1-200	Order 12. <i>Graphidaceae</i>	10-20	Order 23. <i>Opiliodontaceae</i> , 77	180-200
— 7. <i>Typhaceae</i>	10-20	— 22. <i>Martyniaceae</i> , 74	1-20	— 13. <i>Cuscutaceae</i> , 29	10-20	— 24. <i>Polypodiaceae</i> , 78	180-200
— 8. <i>Hedyotaceae</i>	10-20			— 14. <i>Entomaceae</i>	10-20	— 25. <i>Dianthaceae</i> , 82	180-200
— 9. <i>Diatryaceae</i>	10-20						
— 10. <i>Hedyotaceae</i>	10-20						
— 11. <i>Mucronaceae</i>	10-20						
	100-120						
Alliance III. <i>Liliaceae</i> .		Alliance VI. <i>Funariaceae</i> .		Alliance III. <i>Liliaceae</i> .		Alliance VI. <i>Funariaceae</i> .	
Order 12. <i>Graphidaceae</i>	10-20	Order 21. <i>Lycopodiaceae</i> , 60	1-200	Order 12. <i>Graphidaceae</i>	10-20	Order 21. <i>Lycopodiaceae</i> , 60	1-200
— 13. <i>Cuscutaceae</i> , 29	10-20	— 22. <i>Martyniaceae</i> , 74	1-20	— 13. <i>Cuscutaceae</i> , 29	10-20	— 22. <i>Martyniaceae</i> , 74	1-20
— 14. <i>Entomaceae</i>	10-20			— 14. <i>Entomaceae</i>	10-20		
	100-120						
Total . . .		Total . . .		Total . . .		Total . . .	
	250-300		100-120		100-120		100-120
Class II. <i>Angiosperms</i> .		Class III. <i>Rhizomorphs</i> .		Class IV. <i>Endogens</i> .		Class IV. <i>Endogens</i> .	
Alliance IV. <i>Moraceae</i> .		Alliance VII. <i>Graminifera</i> .		Alliance VIII. <i>Graminifera</i> .		Alliance VIII. <i>Graminifera</i> .	
Order 15. <i>Riceaceae</i> , 27	10-20	Order 29. <i>Graminifera</i> , 103	241-250	Order 29. <i>Graminifera</i> , 103	241-250	Order 29. <i>Graminifera</i> , 103	241-250
— 16. <i>Martyniaceae</i> , 28	15-20	— 30. <i>Cyperaceae</i> , 117	110-120	— 30. <i>Cyperaceae</i> , 117	110-120	— 30. <i>Cyperaceae</i> , 117	110-120
— 17. <i>Juncaceae</i> , 20	10-20	— 31. <i>Dioscoreaceae</i> , 120	40-45	— 31. <i>Dioscoreaceae</i> , 120	40-45	— 31. <i>Dioscoreaceae</i> , 120	40-45
— 18. <i>Euphorbiaceae</i> , 40	1-10	— 32. <i>Rubiaceae</i> , 121	20-191	— 32. <i>Rubiaceae</i> , 121	20-191	— 32. <i>Rubiaceae</i> , 121	20-191
— 19. <i>Anthriscaceae</i> , 65	1-10	— 33. <i>Eriocaulaceae</i> , 122	20-200	— 33. <i>Eriocaulaceae</i> , 122	20-200	— 33. <i>Eriocaulaceae</i> , 122	20-200
— 20. <i>Dryaceae</i> , 64	14-110						
	100-120						
Alliance V. <i>Lycopodiaceae</i> .		Alliance VIII. <i>Graminifera</i> .		Alliance VIII. <i>Graminifera</i> .		Alliance VIII. <i>Graminifera</i> .	
Order 21. <i>Lycopodiaceae</i> , 60	1-200	Order 29. <i>Graminifera</i> , 103	241-250	Order 29. <i>Graminifera</i> , 103	241-250	Order 29. <i>Graminifera</i> , 103	241-250
— 22. <i>Martyniaceae</i> , 74	1-20	— 30. <i>Cyperaceae</i> , 117	110-120	— 30. <i>Cyperaceae</i> , 117	110-120	— 30. <i>Cyperaceae</i> , 117	110-120
	100-120	— 31. <i>Dioscoreaceae</i> , 120	40-45	— 31. <i>Dioscoreaceae</i> , 120	40-45	— 31. <i>Dioscoreaceae</i> , 120	40-45
		— 32. <i>Rubiaceae</i> , 121	20-191	— 32. <i>Rubiaceae</i> , 121	20-191	— 32. <i>Rubiaceae</i> , 121	20-191
		— 33. <i>Eriocaulaceae</i> , 122	20-200	— 33. <i>Eriocaulaceae</i> , 122	20-200	— 33. <i>Eriocaulaceae</i> , 122	20-200
Alliance VI. <i>Funariaceae</i> .		Alliance VIII. <i>Graminifera</i> .		Alliance VIII. <i>Graminifera</i> .		Alliance VIII. <i>Graminifera</i> .	
Order 23. <i>Opiliodontaceae</i> , 77	180-200	Order 29. <i>Graminifera</i> , 103	241-250	Order 29. <i>Graminifera</i> , 103	241-250	Order 29. <i>Graminifera</i> , 103	241-250
— 24. <i>Polypodiaceae</i> , 78	180-200	— 30. <i>Cyperaceae</i> , 117	110-120	— 30. <i>Cyperaceae</i> , 117	110-120	— 30. <i>Cyperaceae</i> , 117	110-120
— 25. <i>Dianthaceae</i> , 82	180-200	— 31. <i>Dioscoreaceae</i> , 120	40-45	— 31. <i>Dioscoreaceae</i> , 120	40-45	— 31. <i>Dioscoreaceae</i> , 120	40-45
	180-200	— 32. <i>Rubiaceae</i> , 121	20-191	— 32. <i>Rubiaceae</i> , 121	20-191	— 32. <i>Rubiaceae</i> , 121	20-191
		— 33. <i>Eriocaulaceae</i> , 122	20-200	— 33. <i>Eriocaulaceae</i> , 122	20-200	— 33. <i>Eriocaulaceae</i> , 122	20-200
Total . . .		Total . . .		Total . . .		Total . . .	
	100-120		100-120		100-120		100-120



Class V. DICTYOGENS.		Gen	Sp.						Gen	Sp.							
Order 67. Triuridaceæ, 213		2	2						Order 112. Samydeæ, 330	5	80						
— 68. Dioscoreaceæ, 214		6	110						— 113. Passifloraceæ, 332	12	210						
— 69. Smilaceæ, 215		2	120						— 114. Malesherbiaceæ, 335	2	5						
— 70. Philesiaceæ, 217		2	2						— 115. Moringaceæ, 336	1	4						
— 71. Trilliaceæ, 218		4	30						— 116. Violaceæ, 338	11	300						
— 72. Roxburghiaceæ, 219		1	4	17	268				— 117. Frankeniaceæ, 340	4	24						
									— 118. Tamariaceæ, 341	3	43						
Total . . . . .				17	268				— 119. Sauvagesiaceæ, 343	3	15						
									— 120. Crassulaceæ, 344	22	450						
									— 121. Turneraceæ, 347	2	60	98	1282				
Class VI. GYMNOGENS.									Alliance XXVII. Cistales.								
Order 73. Cycadaceæ, 223		6	45						Order 122. Cistaceæ, 349	7	185						
— 74. Pinaceæ, 226		20	100						— 123. Brassicaceæ, 351	173	1600						
— 75. Taxaceæ, 230		9	50						— 124. Resedaceæ, 356	6	41						
— 76. Gnetaeæ, 232		2	15	37	210				— 125. Capparidaceæ, 357	28	340	214	2166				
Total . . . . .				37	210				Alliance XXVIII. Malvales.								
Class VII. EXOGENS.									Order 126. Sterculiaceæ, 360	34	125						
Alliance XVIII. Amentales.									— 127. Byttneriaceæ, 363	45	400						
Order 77. Casuarinaceæ, 249		1	20						— 128. Vivianiaceæ, 365	4	15						
— 78. Betulaceæ, 251		2	65						— 129. Tropæolaceæ, 366	5	43						
— 79. Altingiaceæ, 253		1	3						— 130. Malvaceæ, 368	37	1000						
— 80. Salicaceæ, 254		2	220						— 131. Tiliaceæ, 371	35	350	160	1933				
— 81. Myricaceæ, 256		3	20						Alliance XXIX. Sapindales.								
— 82. Elæagnaceæ, 257		4	30	13	358				Order 132. Tremandraceæ, 374	3	16						
Alliance XIX. Urticales.									— 133. Polygalaceæ, 375	19	495						
Order 83. Stilaginaceæ, 259		3	20						— 134. Vochyaceæ, 379	8	51						
— 84. Urticaceæ, 260		23	300						— 135. Staphyleaceæ, 381	3	14						
— 85. Ceratophyllaceæ, 263		1	6						— 136. Sapindaceæ, 382	50	380						
— 86. Cannabinaceæ, 265		2	2						— 137. Petiveriaceæ, 386	3	10						
— 87. Moraceæ, 266		8	184						— 138. Aceraceæ, 387	3	60						
— 88. Artocarpaceæ, 269		23	54						— 139. Malpighiaceæ, 388	42	555						
— 89. Platanaceæ, 272		1	6	61	572				— 140. Erythoxylaceæ, 391	1	75	132	1656				
Alliance XX. Euphorbiales.									Alliance XXX. Guttiferales.								
Order 90. Euphorbiaceæ, 274		191	2500						Order 141. Dipteraceæ, 393	7	47						
— — Gyrostemonaceæ, 282		2	3						— — Lophiraceæ, 395	1	1						
— 91. Scœpaceæ, 283		3	6						— 142. Ternstroëmiaceæ,								
— 92. Callitrichaceæ, 284		1	6						— 143. Rhizopholaceæ, 398	33	130						
— 93. Empetraceæ, 285		4	4						— 144. Clusiaceæ, 400	2	8						
— — Batideæ, 286		1	2						— 145. Marcgraviaceæ, 403	30	150						
— 94. Nepenthaceæ, 287		1	6	203	2527				— 146. Hypericaceæ, 405	4	26						
Alliance XXI. Quernales.									— 147. Reaumuriaceæ, 407	13	276						
Order 95. Corylaceæ, 290		8	265						Alliance XXXI. Nymphales.								
— 96. Juglandaceæ, 292		4	27	12	292				Order 148. Nymphaeaceæ, 409	5	50						
Alliance XXII. Garryales.									— 149. Cabombaceæ, 412	2	3						
Order 97. Garryaceæ, 295		2	6						— 150. Nelumbiaceæ, 414	1	3	8	56				
— 98. Helwingiaceæ, 296		1	1	3	7				Alliance XXXII. Ranales.								
Alliance XXIII. Menispermals.									Order 151. Magnoliaceæ, 417	11	65						
Order 99. Monimiaceæ, 298		8	40						— 152. Anonaceæ, 420	20	300						
— 100. Atherosperm-									— 153. Dilleniaceæ, 423	26	200						
— — aceæ, 300		3	4						— 154. Ranunculaceæ, 425	41	1000						
— 101. Myristicaceæ, 301		5	35						— — Cephalotæ, 428	1	1						
— 102. Lardizabalaceæ, 303		7	15						— 155. Sarraceniaceæ, 429	2	7						
— 103. Schizandraceæ, 305		5	12						— 156. Papaveraceæ, 430	18	130	119	1703				
— 104. Menisperm-									Alliance XXXIII. Berberales.								
— — aceæ, 307		11	175	39	281				Order 157. Droseraceæ, 433	7	90						
Alliance XXIV. Cucurbitales.									— 158. Fumariaceæ, 435	15	110						
Order 105. Cucurbitaceæ, 311		56	270						— 159. Berberidaceæ, 437	12	100						
— 106. Datisaceæ, 316		3	4						— 160. Vitaceæ, 439	7	260						
— 107. Begoniaceæ, 318		2	159	61	433				— 161. Pittosporaceæ, 441	12	78						
Alliance XXV. Papayales.									— — Canellaceæ, 442	2	3						
Order 108. Papayaceæ, 321		8	25						— 162. Olacaceæ, 443	21	48						
— 109. Pangiacæ, 323		3	4	11	29				— 163. Cyrillaceæ, 445	3	5	79	604				
Alliance XXVI. Violales.									Alliance XXXIV. Ericales.								
Order 110. Flacourtiaceæ, 327		31	85						Order 164. Humiriaceæ, 447	4	10						
— 111. Lacistemaceæ, 329		2	6						— 165. Epacridaceæ, 448	30	320						
									— 166. Pyrolaceæ, 450	5	20						
									— 167. Francoaceæ, 451	2	5						



			(Total)								
			1000			1000			1000		
			1000			1000			1000		
Order 168. Monardraceae, 407	3	3									
— 169. Eriogonaceae, 402	3	3									
Alliance XXXV. <i>Rubiacae</i>											
Order 170. Anemoneaceae, 407	3	3									
— 171. Anemoneaceae, 407	3	3									
— 172. Compositae, 404	3	3									
— 173. Monardraceae, 407	3	3									
— 174. Anemoneaceae, 407	3	3									
— 175. Compositae, 404	3	3									
— 176. Rubiacae, 407	3	3									
— 177. Nymphaeaceae, 407	3	3									
— 178. Orobanchaceae, 474	3	3									
— 179. Curculionidae, 475	3	3									
— 180. Scrophulariaceae, 471	3	3									
— 181. Zingiberaceae, 475	3	3									
— 182. Poaceae, 475	3	3									
All. XXXVI. <i>Geraniaceae</i>											
Order 183. Linnaea, 485	3	3									
— 184. Orobanchaceae, 485	3	3									
— 185. Orobanchaceae, 485	3	3									
— 186. Ranunculaceae, 485	3	3									
— 187. Geraniaceae, 485	3	3									
Alliance XXXVII. <i>Scrophulariaceae</i>											
Order 188. Caryophyllaceae, 485	3	3									
— 189. Ranunculaceae, 485	3	3									
— 190. Ranunculaceae, 485	3	3									
— 191. Ranunculaceae, 485	3	3									
Alliance XXXVIII. <i>Chrysanthemaceae</i>											
Order 192. Nyctaginaceae, 485	3	3									
— 193. Ranunculaceae, 485	3	3									
— 194. Ranunculaceae, 485	3	3									
— 195. Ranunculaceae, 485	3	3									
Alliance XXXIX. <i>Pyrolaceae</i>											
Order 196. Pipernaceae, 515	3	3									
— 197. Chloranthaceae, 515	3	3									
— 198. Saururaceae, 521	3	3									
Alliance XL. <i>Ternstroemiaceae</i>											
Order 199. Ranunculaceae, 521	3	3									
— 200. Ranunculaceae, 521	3	3									
— 201. Ranunculaceae, 521	3	3									
— 202. Ranunculaceae, 521	3	3									
Alliance XLI. <i>Juncaceae</i>											
Order 203. Thymelaeaceae, 521	3	3									
— 204. Thymelaeaceae, 521	3	3									
— 205. Thymelaeaceae, 521	3	3									
— 206. Thymelaeaceae, 521	3	3									
Alliance XLII. <i>Asclepiaceae</i>											
Order 207. Calycanthaceae, 542	3	3									
— 208. Calycanthaceae, 542	3	3									
— 209. Calycanthaceae, 542	3	3									
— 210. Calycanthaceae, 542	3	3									
— 211. Calycanthaceae, 542	3	3									
— 212. Calycanthaceae, 542	3	3									
— 213. Calycanthaceae, 542	3	3									
All. XLIII. <i>Saxifragaceae</i>											
Order 214. Saxifragaceae, 574	3	3									
— 215. Hydrangeaceae, 574	3	3									
— 216. Cunoniaceae, 571	3	3									
— 217. Brodiaeaceae, 573	3	3									
— 218. Lythraceae, 574	3	3									



	Gen	Sp.				Gen	Sp.			
Alliance LI. <i>Myrtales</i> .										
Order 274. Combretaceæ, 717	22	200				Alliance LIV. <i>Cinchonales</i> .				
— 275. Alangiaceæ, 719	3	8				Order 291. Vacciniaceæ, 757	13	200		
— 276. Chamælauciaceæ, 721	15	50				— 292. Columelliaceæ, 759	1	3		
— 277. Haloragaceæ, 722	8	70				— 293. Cinchonaceæ, 761	269	2500		
— 278. Onagraceæ, 724	28	450				— 294. Caprifoliaceæ, 766	14	220		
— 279. Rhizophoraceæ, 726	5	20				— 295. Galiaceæ, 768	8	320	305	3243
— 280. Belvisiaceæ, 728	2	4				Alliance LV. <i>Umbellales</i> .				
— 281. Melastomaceæ, 731	118	1200				Order 296. Apiaceæ, 773	267	1500		
— 282. Myrtaceæ, 734	45	1300				— 297. Araliaceæ, 780	21	160		
— 283. Lecythidaceæ, 739	7	38	253	3340		— 298. Cornaceæ, 782	9	40		
Alliance LII. <i>Cactales</i> .										
Order 284. Homaliaceæ, 742	8	30				— 299. Hamamelidaceæ, 784	10	15		
— 285. Loasaceæ, 744	15	70				— 300. Bruniaceæ, 785	15	65	322	1780
— 286. Cactaceæ, 746	16	800	39	900		Alliance LVI. <i>Asarales</i> .				
Alliance LIII. <i>Grossales</i> .										
Order 287. Grossulariaceæ, 750	2	95				Order 301. Santalaceæ, 787	18	110		
— 288. Escalloniaceæ, 752	7	60				— 302. Loranthaceæ, 789	23	412		
— 289. Philadelphaceæ, 753	3	25				— 303. Aristolochiaceæ, 792	8	130	49	652
Order 290. Barringtoniaceæ, 754	10	28	22	208		Total . . . . .				
									6191	66225

## GRAND TOTAL.

Class	I. Thallogens . . . . .	Genera.	Species.
— II. Acrogens . . . . .		939	8394
— III. Rhizogens . . . . .		310	4086
— IV. Endogens . . . . .		21	53
— V. Dictyogens . . . . .		1420	13684
— VI. Gymnogens . . . . .		17	268
— VII. Exogens . . . . .		37	210
		6191	66225
<b>TOTAL . . . . .</b>		8935	92930



# ARTIFICIAL ANALYSIS

## NATURAL ORDERS

### CLASS I. THALLOPHORÆ

Nourished by spawn or mycelium.

Spores in fours.

Hymenium naked.

Hymenium inclosed in a peridium.

Spores or spore cases single.

Spores naked.

Thallus obsolete

Thallus floccose

Spores inclosed,

in asci

in a veil or sporangium

Without spawn.

Aquatic. Algalæ.

Crystalline angular, multiplied by dichotomous

Vesicular, or filamentous, or multicellular, multiplied by binary

Cellular or tubular.

Multiplied by simple spores

— tetrasporous

— spiral coated tubular

Terrestrial. Lichens.

Spores naked

Spores in asci.

Thallus gelatinous or cartilaginous

Thallus pulverulent or cellular

### CLASS II. ACROGENÆ

§ With a distinct neck of growth

Spores without elaters

Spores furnished with elaters.

Spore cases opening into valves

— valveless

§ With a distinct neck of growth

Spores furnished with elaters.

inclosed in cases, opening into valves

naked, collected in cones

Spores without elaters.

Spore cases seated on leaves.

ringed

ringless

Spore cases inclosed within the summit of a quaternary fruit

Spore cases inclosed within an ovicell

Spore cases naked.

sessile in the axil of leaves or bracts

stalked.

valveless

opening into valves

### CLASS III. RHIZOGENÆ

Ovules solitary

Ovules indefinite.

Anthers opening by slits



## CLASS IV. ENDOGENS.

\* *Flowers complete (having distinct floral envelopes).*§ *Ovary inferior.*† *Flowers gynandrous.*

Ovary 1-celled. Seed-coat loose . . . . .	<i>Orchidaceæ</i> , 175
Ovary 3-celled . . . . .	<i>Apostasiaceæ</i> , 184

†† *Flowers not gynandrous.*

Veins of leaves diverging from the midrib.

Anther 1, with 1 cell . . . . .	<i>Marantaceæ</i> , 168
Anther 1, with 2 cells . . . . .	<i>Zingiberaceæ</i> , 165
Anthers 5, or 6 . . . . .	<i>Musaceæ</i> , 160

Veins of leaves parallel with midrib.

Stamens 3.

Anthers turned outwards . . . . .	<i>Iridaceæ</i> , 159
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Anthers turned inwards. (Fruit winged) . . . . .	<i>Burmanniaceæ</i> , 171
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Stamens 6.

Leaves flat.

Fruit 3-celled. Sepals corolline.

Radicl remote from hilum, which is strophiolate . . . . .	<i>Hypoxidaceæ</i> , 154
---	--------------------------

— next the hilum . . . . .	<i>Amaryllidaceæ</i> , 155
----------------------------	----------------------------

Fruit 3-celled. Sepals calycine . . . . .	<i>Bromeliaceæ</i> , 147
---	--------------------------

Fruit 1-celled . . . . .	<i>Taccaceæ</i> , 149
--------------------------	-----------------------

Leaves equitant . . . . .	<i>Hæmodoraceæ</i> , 151
---------------------------	--------------------------

Stamens more than 6 . . . . .	<i>Hydrocharaceæ</i> , 141
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§§ *Ovary superior.*

Sepals calycine or glumaceous.

Carpels separate, more or less.

Placentæ spread over the dissepiments . . . . .	<i>Butomaceæ</i> , 208
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Placentæ narrow . . . . .	<i>Alismaceæ</i> , 209
---------------------------	------------------------

Carpels combined in a solid pistil.

Petals quite distinct from the calyx.

Placentæ axile . . . . .	<i>Commelynaceæ</i> , 188
--------------------------	---------------------------

Placentæ parietal . . . . .	<i>Mayaceæ</i> , 189
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Petals undistinguishable from the calyx.

Flowers scattered . . . . .	<i>Juncaceæ</i> , 191
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Flowers on a spadix . . . . .	<i>Orontiaceæ</i> , 193
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Sepals corolline.

Carpels more or less separate.

Seeds solitary . . . . .	<i>Palmaceæ</i> , 133
--------------------------	-----------------------

Seeds numerous.

Anthers turned outwards . . . . .	<i>Melanthaceæ</i> , 198
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Anthers turned inwards. . . . .	<i>Butomaceæ</i> , 208
---------------------------------	------------------------

Floral envelopes 6 . . . . .	<i>Philydraceæ</i> , 146
------------------------------	--------------------------

Floral envelopes 2 . . . . .	<i>Pontederaceæ</i> , 206
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Carpels combined in a solid pistil.

Petals rolled inwards after flowering . . . . .	<i>Gilliesiaceæ</i> , 196
---	---------------------------

Petals not rolled inwards after flowering. . . . .	<i>Liliaceæ</i> , 200
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Flowers with external appendages . . . . .	<i>Gilliesiaceæ</i> , 196
--	---------------------------

Flowers without external appendages . . . . .	<i>Liliaceæ</i> , 200
---	-----------------------

\*\* *Flower incomplete (having no distinct floral envelopes except leaves).*§ *Flowers glumaceous.*

Stems hollow . . . . .	<i>Graminaceæ</i> , 106
------------------------	-------------------------

Stems solid.

Carpel solitary. Seed erect . . . . .	<i>Cyperaceæ</i> , 117
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Carpel solitary. Seed pendulous . . . . .	<i>Restiaceæ</i> , 121
---	------------------------

Carpels several, distinct.

Glumes only . . . . .

A membranous cup within the glumes . . . . .	<i>Desvauxiaceæ</i> , 120
--	---------------------------

A membranous cup within the glumes . . . . .	<i>Eriocaulaceæ</i> , 122
--	---------------------------

Carpels several, combined.

Placentæ parietal . . . . .	<i>Xyridaceæ</i> , 187
-----------------------------	------------------------

Placentæ central . . . . .	<i>Restiaceæ</i> , 121
----------------------------	------------------------

§§ *Flowers naked; or with a few verticillate leaves.*† *Flowers on a spadix.*

Fruit drupaceous . . . . .	<i>Pandanaceæ</i> , 130
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Fruit berried. Leaves in the bud convolute . . . . .	<i>Araceæ</i> , 127
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Fruit dry. Anthers clavate on weak filaments . . . . .	<i>Typhaceæ</i> , 126
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†† *Flowers not on a spadix.*

Floaters. Ovules pendulous.

Pollen globose . . . . .	<i>Naiadaceæ</i> , 143
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Pollen confervoid . . . . .	<i>Zosteraceæ</i> , 145
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Terrestrial. Ovules erect

Floaters. Ovules erect . . . . .	<i>Juncaginaceæ</i> , 210
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Floaters. Ovules erect . . . . .	<i>Pistiaceæ</i> , 124
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## CLASS V. DICTYODIÆS.

## Ovary inferior.

Ovary septate.

Carpels distinct, few.

Carpels consolidated.

Placentas axile.

Flowers 1-axial.

— — — 2-axial.

Placentas basal.

Placentas parietal.

## CLASS VI. GYNOSPERMÆ.

Stem jointed.

Leaves pinnate.

— — — simple.

Females in cones.

— — — solitary.

## CLASS VII. EUSPERMÆ.

## POLYPERMÆ.

## § PERICARPÆÆ. — Stem jointed.

§ Ovary compound pericarpææ.

§ Zoned bearing Ovarypericarpææ.

Carpels more or less distinct but fused to the axis.

§ Carpels of the pericarpææ have a weak point.

Placentas central.

Leaves opposite.

Leaves alternate: Flowers 1-axial.

Placentas parietal.

## §§ Zono-pericarpææ ætiæ.

§ Carpels more or less distinct but fused to the axis.

Carpels numerous, quite inferior.

§ Carpels of the pericarpææ have a weak point.

Placentas spread over the surface of the dissepiment.

Placentas parietal.

Females distribute the number of styles from within.

Females distribute the number of styles from without.

Placentas in the axis.

Leaves marked with little transverse lines.

Ovary almost flat. Flowers 1-axial.

Ovary with more than one flat. Flowers 1-axial.

Leaves clasped.

Females distribute the number of styles from within.

Females distribute the number of styles from without.

Females and styles 1-axial.

Females and styles 2-axial.

Style 1.

Styles disunited.

## §§ Ovary widely septate.

§ Ovary compound wide septate.

§ Carpels more or less distinct but fused to the axis.

Stamens polygynous.

Carpel solitary.

Carpels two.

Stamens polygynous.

Styles from the apex of the ovary.

Carpel 1.

Carpels more than 1.

Styles from the base of the ovary.

§ Carpels of the pericarpææ have a weak point.

Placentas parietal.

Leaves marked with little transverse lines.

Leaves marked with round and linear transverse lines.

Placentas in the axis: 1 per axil point.



Calyx with an imbricated aestivation.	
Flowers unisexual . . . . .	Euphorbiaceæ, 274
Flowers hermaphrodite.	
Ovary 1-celled. Sepals 2 . . . . .	Portulacaceæ, 500
Ovary with more cells than one.	
Calyx double . . . . .	Chlœnaceæ, 486
Calyx single . . . . .	Cistaceæ, 349
Calyx with a valvate aestivation.	
Stamens monadelphous. Anthers 2-celled.	
Stamens columnar, all perfect . . . . .	Sterculiaceæ, 360
Stamens not columnar, partly sterile . . . . .	Bythneriaceæ, 363
Stamens monadelphous. Anthers 1-celled . . . . .	Malvaceæ, 368
Stamens monadelphous. Calyx irregular and enlarged in the fruit . . . . .	Dipteraceæ, 393
Stamens quite distinct . . . . .	Tiliaceæ, 371
++ Leaves without stipules.	
† Carp. more or less distinct (at least as to the styles); or solitary.	
Carpels immersed in a fleshy table-shaped disk . . . . .	Nelumbiaceæ, 414
Carpels not immersed in a disk.	
Stamens perigynous.	
Carpel 1 . . . . .	Drupaceæ, 557
Carpels more than 1 . . . . .	Rosaceæ, 563
Stamens hypogynous.	
Embryo in vitellus . . . . .	Cabombaceæ, 412
Embryo naked, very minute.	
Seeds with an aril . . . . .	Dilleniaceæ, 423
Seeds without an aril. Albumen fleshy. . . . .	
Flowers ♀ . . . . .	Ranunculaceæ, 425
Flowers ♂ ♀ . . . . .	Schizandraceæ, 305
Seeds usually without an aril. Albumen aromatic and ruminant . . . . .	Anonaceæ, 420
nearly as long as seed.	
Calyx much imbricated.	
Fruit a legume . . . . .	Fabaceæ, 544
Fruit not a legume.	
Seeds smooth . . . . .	Hypericaceæ, 405
Seeds hairy . . . . .	Reaumuriaceæ, 407
Calyx but little imbricated.	
Fruit not a legume . . . . .	Anacardiaceæ, 465
Fruit a legume . . . . .	Fabaceæ, 544
†† Carpels wholly combined into a solid pistil, with more placentas than one.	
Placentas parietal, in distinct lines.	
Anthers versatile. Juice watery . . . . .	Capparidaceæ, 357
Anthers innate. Juice milky . . . . .	Papaveraceæ, 430
Placentas parietal, spread over the lining of the fruit . . . . .	Flacourtiaceæ, 327
Placentas spread over the dissepiments . . . . .	Nymphæaceæ, 409
Placentas in the axis.	
Stigma large, broad, and petaloid . . . . .	Sarraceniaceæ, 429
Stigma simple.	
Ovary 1-celled, with free central placenta . . . . .	Portulacaceæ, 500
Ovary many-celled.	
Calyx much imbricated.	
Leaves compound . . . . .	Rhizobolaceæ, 398
Leaves simple.	
Petals equal in number to sepals.	
Seeds few . . . . .	Chusiaceæ, 400
Seeds numerous. Petals flat . . . . .	Marcgraaviaceæ, 403
Seeds numerous. Petals crumpled . . . . .	Cistaceæ, 349
Calyx but little, or not at all, imbricated.	
Stamens perigynous. Calyx tubular . . . . .	Lythraceæ, 574
Stamens hypogynous. Calyx many-leaved . . . . .	Humiriaceæ, 447
** OLIGANDROUS. Stamens fewer than 20.	
§ Ovary inferior, or partially so.	
† Leaves furnished with stipules.	
Placentas parietal . . . . .	Homaliaceæ, 742
Placentas in the axis.	
Flowers completely unisexual . . . . .	Begoniaceæ, 318
Flowers hermaphrodite or polygamous.	
Stamens equal to the petals and opposite them . . . . .	Rhamnaceæ, 581
Stamens, if equal to the petals, alternate with them.	
Leaves opposite . . . . .	Rhizophoraceæ, 726
Leaves alternate . . . . .	Hamamelidaceæ, 722
++ Leaves destitute of stipules.	
Placentas parietal.	
Flowers completely unisexual. . . . .	Cucurbitaceæ, 311
Flowers hermaphrodite or polygamous . . . . .	Grossulaceæ, 750
Placentas in the axis.	
Flowers in umbels. Styles 2 . . . . .	Apiaceæ, 773
Flowers in umbels. Styles 3 or more . . . . .	Araliaceæ, 780



Flowers not in fruit.

Carpel solitary.

Petal oblong, linear.

Petal very narrow.

Petal oblong, linear.

Cotyledons flat.

Petal narrow, linear.

Carpel elongate, at the base.

Leaves alternate.

Leaves opposite.

Carpel pedicel, elongate.

Calyx valvate.

Calyx valvate.

Albumen copious.

Calyx valvate.

Stamens elongate, at the base.

Stamens elongate, at the base.

Leaves alternate.

Leaves opposite.

Parts of flower 4.

Ovary elongate, at the base.

Ovary pedicel.

Parts of flower 4.

Leafy.

Seeds pedicel.

Parts of flower 4.

§§ 0

*L. ...*

*Carpel distinct or solitary.*

Anthers with recurved valves.

Anthers with longitudinal valves.

Style from base of carpel.

Style from apex of ovary.

Style from apex of carpel.

*Carpel ...*

Placentas parietal.

Flowers with a ring of appendages.

Flowers without any ring of appendages.

Leaves with round and oblong transparent dots.

Leaves dotless, striate when young.

Leaves dotless, striate when young.

Leaves dotless, striate when young.

Placentas in the axis.

Styles distinct to the base.

Calyx in a broken whole, much imbricated.

Calyx but little imbricated, in a broken whole.

Flowers unisexual.

Flowers hermaphrodite or polygamous.

Petal minute.

Petal conspicuous.

Petal conspicuous.

Petal conspicuous.

Calyx valvate.

Styles more or less combined.

Gynobase fleshy.

Gynobase dry.

Gynobase dry.

Fruit bunched.

Fruit not bunched.

Styles more or less combined.

Calyx much imbricated, in a broken whole.

Flowers spurred.

Flowers not spurred.

Flowers not spurred.

Calyx but little imbricated, in a broken whole.

Leaves compound.

Leaves simple.

Leaves simple.

Calyx valvate or apert.

Stamens columnar.

Stamens not columnar.

Stamens opposite to petals.

Perigynous.

Hypogynous.

Stamens alternate with the mouth of the ovary.

Anthers opposite by pairs.

Anthers opposite by pairs.

Anthers opposite by pairs.



†† *Leaves destitute of stipules.*‡ *Carpels more or less distinct, or solitary.*

Anthers with recurved valves . . . . .	<i>Berberidaceæ</i> , 437
Anthers with longitudinal valves . . . . .	
Fruit leguminous. Radicle next hilum . . . . .	<i>Fabaceæ</i> , 544
Fruit leguminous. Radicle remote from hilum . . . . .	<i>Connaraceæ</i> , 468
Fruit not leguminous.	
Carpels each with an hypogynous scale . . . . .	<i>Crassulaceæ</i> , 344
Carpels each with two hypogynous scales . . . . .	<i>Francoaceæ</i> , 451
Carpels without hypogynous scales.	
Albumen very abundant. Embryo minute.	
Flowers ♂ ♀ . . . . .	<i>Lardizabalaceæ</i> , 303
Flowers ♀ . . . . .	
Embryo in vitellus . . . . .	<i>Cabombaceæ</i> , 412
Embryo naked.	
Herbs. Albumen solid . . . . .	<i>Ranunculaceæ</i> , 425
Shrubs. Albumen ruminant . . . . .	<i>Anonaceæ</i> , 420
Albumen in small quantity or wholly wanting.	
Carpels several, all perfect :	
inclosed in the tube of the calyx . . . . .	<i>Calycanthaceæ</i> , 540
naked. Flowers unisexual . . . . .	<i>Menispermaceæ</i> , 307
Carpels solitary, or all but one imperfect.	
Leaves dotted . . . . .	<i>Amyridaceæ</i> , 459
Leaves dotless . . . . .	<i>Anacardiaceæ</i> , 465

‡‡ *Carpels combined into a solid pistil.*

Placentas parietal.	
Stamens tetradynamous . . . . .	<i>Brassicaceæ</i> , 351
Stamens not tetradynamous.	
Flowers with a ring or crown of sterile stamens.	
Sexes distinct.	
Female flower coronetted . . . . .	<i>Pangiaceæ</i> , 323
— not coronetted . . . . .	<i>Papayaceæ</i> , 321
Sexes combined. Placentæ lining the fruit . . . . .	<i>Flacourtiaceæ</i> , 327
Sexes combined. Placentæ in rows. Ovary stalked . . . . .	<i>Malesherbiaceæ</i> , 335
Flowers without sterile stamens.	
Hypogynous disk large. Stamens indefinite . . . . .	<i>Cappariaceæ</i> , 357
Hypogynous disk large. Stamens definite . . . . .	<i>Resedaceæ</i> , 356
Hypogynous disk small or wanting.	
Albumen very abundant. Embryo minute . . . . .	<i>Papaveraceæ</i> , 430
Albumen in small quantity, or wholly wanting.	
Calyx 5-leaved . . . . .	<i>Turneraceæ</i> , 347
Calyx tubular . . . . .	<i>Frankeniaceæ</i> , 340
Placentas covering the dissepiments . . . . .	<i>Nymphæaceæ</i> , 409
Placentas axile.	
Styles distinct to the base.	
Calyx valvate . . . . .	<i>Vivianiaceæ</i> , 365
Calyx in a broken whorl, much imbricated.	
Seeds hairy . . . . .	<i>Reaumuriaceæ</i> , 407
Seeds smooth. Stamens polyadelphous . . . . .	<i>Hypericaceæ</i> , 405
Seeds smooth. Stamens monadelphous or free . . . . .	<i>Linaceæ</i> , 485
Calyx but little imbricated, in a complete whorl.	
Carpels each with an hypogynous scale . . . . .	<i>Crassulaceæ</i> , 344
Carpels destitute of hypogynous scales.	
Carpels 2, divaricating at the apex . . . . .	<i>Saxifragaceæ</i> , 567
Carpels not divaricating at apex . . . . .	<i>Caryophyllaceæ</i> , 496
Styles more or less combined. Gynobasic.	
Stamens arising from scales . . . . .	<i>Simarubaceæ</i> , 476
Stamens not arising from scales.	
Styles wholly combined. Flowers hermaphrodite . . . . .	<i>Rutaceæ</i> , 469
Styles wholly combined. Flowers unisexual . . . . .	<i>Xanthoxylaceæ</i> , 472
Styles divided at point. Flowers irregular . . . . .	<i>Balsaminaceæ</i> , 490
Styles more or less combined. Not gynobasic.	
Calyx much imbricated, in a broken whorl.	
Flowers symmetrical . . . . .	<i>Clusiaceæ</i> , 400
Flowers unsymmetrical.	
Flowers regular.	
Petals without appendages . . . . .	<i>Aceraceæ</i> , 387
Petals with appendages . . . . .	<i>Sapindaceæ</i> , 382
Flowers papilionaceous . . . . .	<i>Polygalaceæ</i> , 375
Calyx but little imbricated, in a complete whorl.	
Carpels 4 or more. Anthers opening by pores.	
Embryo in the axis . . . . .	<i>Ericaceæ</i> , 453
Embryo (very minute) at the base . . . . .	<i>Pyrolaceæ</i> , 450
Carpels 4 or more. Anthers opening by slits.	
Seeds winged.	
Leafy . . . . .	<i>Cedrelaceæ</i> , 461
Scaly (parasites) . . . . .	<i>Monotropaceæ</i> , 452
Seeds wingless.	
Stamens united into a long tube . . . . .	<i>Meliaceæ</i> , 463
Stamens free or nearly so.	
Leaves dotted. Seeds amygdaloid . . . . .	<i>Aurantiaceæ</i> , 457



- Leaves dotless. Seed minute.
- Leafy .
- Seeds parietal.
- Carpels fewer than 4.
- Flowers unisexual.
- Flowers hermaphrodite.
- Sepals 2.
- Sepals more than 2.
- Stamens hypogynous.
- Seeds minute.
- Seeds naked.
- Ovules ascending or horizontal.
- Ovules pendulous.
- Stamens perianthial.
- Ovules ascending.
- Ovules suspended.
- Calyx valvate or open.
- Anthers opening by pores.
- Anthers opening by slits.
- Stamens if equal in number to petals . . . . .
- Stamens if equal in number to petals . . . . .
- Leaves pinnate.
- Leaves simple. Calyx tubular. . . . .
- Leaves simple. Calyx fringed. . . . .

## APPENDIX

## \* Acaulescent

## † Leaves flattened and elongated

- Ovules very numerous.
- Seeds winged . . . . .
- Seeds comose . . . . .
- Ovules solitary or very few.
- Flowers hermaphrodite.
- Stamens unilateral . . . . .
- Stamens whorled . . . . .
- Flowers unisexual.
- Carpels solitary. . . . .
- Carpels solitary. . . . .
- Carpels triple . . . . .

## †† Leaves distichous or opposite

- Ovules very numerous.
- Ovules solitary or very few.
- Flowers hermaphrodite.
- Embryo in vitellus . . . . .
- Embryo without vitellus . . . . .
- Flowers unisexual.
- Flowers naked. . . . .
- Flowers naked. . . . .
- Flowers in an involucre. . . . .
- Flowers in an involucre. . . . .

## \*\*\* Monocotyledonous

## § Ovary 3-celled, or 6-celled

## † Leaves flattened and elongated

- Flowers hermaphrodite . . . . .
- Flowers unisexual. . . . .
- Flowers unisexual. . . . .
- many-seeded . . . . .
- one-seeded . . . . .

## †† Leaves lanceolate

- Flowers unisexual, amentaceous.
- Leaves simple, alternate . . . . .
- Leaves simple, opposite . . . . .
- Leaves compound . . . . .
- Flowers unisexual, not amentaceous.
- Seeds immersed in pulp . . . . .
- Seeds dry : . . . . .
- numerous, parietal . . . . .
- solitary, axile . . . . .
- Flowers hermaphrodite or polyandrous.
- Leaves with transparent dots . . . . .
- Leaves without dots . . . . .
- Ovary 3-6-celled, polyspermous . . . . .
- Ovary 1-celled. . . . .



Embryo straight; cotyledons convolute	<i>Combretaceæ</i> , 717
Embryo straight; cotyledons flat.	
Albumen none	<i>Haloragaceæ</i> , 722
Albumen fleshy	<i>Santalaceæ</i> , 787
Embryo curved; cotyledons flat	<i>Chenopodiaceæ</i> , 512
Ovary 1-celled. Anther many-celled	<i>Loranthaceæ</i> , 789
Ovary with more cells than 1, but neither 3 nor 6.	
Embryo straight	<i>Haloragaceæ</i> , 722
Embryo curved	<i>Tetragoniaceæ</i> , 527

## §§ Ovary superior.

## † Leaves furnished with stipules.

Flowers hermaphrodite.	
Sepals 2	<i>Portulacaceæ</i> , 500
Sepals more than 2.	
Carpels more than 1, combined into a solid pistil.	
Stamens hypogynous. Placentas parietal	<i>Flacourtiaceæ</i> , 327
Stamens hypogynous. Placentas in the axis.	
Calyx valvate. Stamens monadelphous:	
partly sterile	<i>Byttneriaceæ</i> , 363
all fertile	<i>Sterculiaceæ</i> , 360
Calyx valvate. Stamens distinct	<i>Tiliaceæ</i> , 371
Calyx imbricated. Fruit beaked	<i>Geraniaceæ</i> , 493
Calyx imbricated. Fruit not beaked	<i>Malpighiaceæ</i> , 388
Stamens perigynous. Placentas parietal	<i>Passifloraceæ</i> , 332
Stamens perigynous. Placentas in the axis.	
Leaves opposite. Stamens more than sepals	<i>Cunoniaceæ</i> , 571
Leaves alternate. Stamens alternate with sepals	<i>Rhamnaceæ</i> , 581
Leaves alternate. Calyx membranous and ragged	<i>Ulmaceæ</i> , 580
Carpels solitary, or quite separate.	
Calyx membranous (stamens hypogynous)	<i>Illecebraceæ</i> , 499
Calyx firm and herbaceous.	
Styles from the base of carpels	<i>Chrysobalanaceæ</i> , 542
Styles terminal; one to each ovary.	
Fruit leguminous	<i>Fabaceæ</i> , 544
Fruit not leguminous	<i>Sanguisorbaceæ</i> , 561
Styles terminal; three to each ovary.	
Stipules ochreate	<i>Polygonaceæ</i> , 502
Stipules simple	<i>Phytolaccaceæ</i> , 509
Flowers unisexual.	
Carpels more than 1, combined into a solid pistil.	
Flowers amentaceous. Seeds arillate	<i>Scopaceæ</i> , 283
Flowers amentaceous. Seeds not arillate	<i>Betulaceæ</i> , 251
Flowers amentaceous. Seeds numerous. Placentæ parietal	<i>Lacistemaceæ</i> , 329
Flowers not amentaceous	<i>Euphorbiaceæ</i> , 274
Carpels solitary.	
Cells of anthers perpendicular to the filament	<i>Stilaginaceæ</i> , 259
Cells of anthers parallel with the filament.	
Embryo straight:	
albuminous. Stipules small	<i>Urticaceæ</i> , 260
exalbuminous. Stipules large	<i>Artocarpaceæ</i> , 269
Embryo hooked:	
exalbuminous	<i>Cannabinaceæ</i> , 265
albuminous	<i>Moraceæ</i> , 266

## †† Leaves destitute of stipules.

Flowers hermaphrodite.	
Sepals 2	<i>Portulacaceæ</i> , 500
Sepals more than 2.	
Carpels more than 1, combined into a solid pistil.	
Placentas parietal, in lines	<i>Papaveraceæ</i> , 430
Placentas parietal, lining the pericarp	<i>Flacourtiaceæ</i> , 327
Placentas in the axis.	
Ovary with a very small number of ovules.	
Calyx short, herbaceous Gynobasic	<i>Rutaceæ</i> , 469
Calyx short, herbaceous, not gynobasic.	
Embryo curved round mealy albumen	<i>Phytolaccaceæ</i> , 509
Embryo straight	<i>Celastraceæ</i> , 586
Calyx tubular, coloured	<i>Penæaceæ</i> , 577
Ovary with numerous ovules.	
Two divaricating carpels	<i>Saxifragaceæ</i> , 567
Carpels not divaricating. Stamens hypogynous.	
Leaves opposite	<i>Caryophyllaceæ</i> , 496
Leaves alternate	<i>Podostemaceæ</i> , 482
Carpels not divaricating. Stamens perigynous.	
Fruit 1-celled	<i>Primulaceæ</i> , 644
Fruit many-celled	<i>Lythraceæ</i> , 574
Carpels solitary or quite separate.	
Carpels several. Stamens hypogynous	<i>Ranunculaceæ</i> , 425
Carpel single.	
Anther-valves recurved. Leafy	<i>Lawraceæ</i> , 535
Anther-valves recurved. Leafless	<i>Cassythaceæ</i> , 538
Anther-valves slit.	
Fruit a legume	<i>Fabaceæ</i> , 549



- Fruit not a berry.
- Calyx long or tubular, with a long tube.
- Calyx long or tubular, with a long tube.
- Calyx long or tubular, no where hairy.
- Stamens in the points of the lobes.
- Stamens not in the points of the lobes.
- Ovules erect.
- Ovules pendulous.
- Fruit 2-valved.
- Fruit indehiscent.
- Calyx short, not tubular or long.
- Leaves lepidote.
- Leaves dotted, not lepidote.
- Leaves neither dotted nor lepidote.
- Flowers in involuclers.
- Flowers naked.
- Calyx dry and coloured.
- Calyx herbaceous or succulent.
- Stamens hypogynous.
- Stamens perigynous.

## Flowers unisexual.

- Carpels more than one, combined into one.
- Ovules indefinite in number.
- Stamens columnar.
- Ovules definite in number.
- Leaves alternate, dotted.
- Leaves alternate, not dotted.
- Carpels solitary, or quite separate.
- Calyx tubular, trid.
- Calyx open, carpels several.
- Calyx open, carpel solitary.
- Embryo straight (without albumen).
- Embryo curled (round mealy albumen).

## MONOPETALOUS.

\* *Ovary capitate.* P.† *Ovary 3-4-5-lobed.*

- Leaves dotted.
- Leaves dotless. Inflorescence gyrate.
- Leaves dotless. Inflorescence straight.
- Corolla with a plaited aestivation.
- Corolla with a flat aestivation.

‡ *Ovary not lobed.*

- Carpels from 4 to 5, or none.
- Anthers opening by pores.
- Seeds winged. Herbs.
- Anthers 2-celled. Seeds winged.
- Anthers 1-celled. Shrubs.
- Anthers opening by slits.
- Stamens equal in number to petals and sepals.
- Shrubs.
- Herbs.
- Stamens not opposite the petals if of 2.
- Seeds indefinite.
- Carpels distinct.
- Carpels combined. Brown parasites.
- Seeds definite.
- Carpels distinct.
- Carpels combined.
- Ovules erect.
- Aestivation of corolla imbricate.
- Aestivation of corolla plicate.
- Ovules pendulous.
- Stamens twice as many as carpels.
- Stamens same number as carpels.

## Carpels usually three.

- Inflorescence gyrate.
- Inflorescence straight.

## Flowers

## Flowers

An hypogynous disk.

No hypogynous disk.

## Carpels only two.

- Diandrous. Corolla valvate.
- Diandrous. Corolla imbricate.

Stamens 4 or more. Indefinite.

Fruit 1-celled.

Fruit 2-celled. Style bifid.

Fruit 2-celled. Style dichotomous.

Stamens 4 or more. Indefinite.

Calyx in a broken whorl.

Leafy.

Scaly parasites.



Calyx in a complete whorl.	
Flowers symmetrical. Carpels $\odot$	<i>Solanaceæ</i> , 618
Flowers symmetrical. Carpels $(\cdot)$ .	
Anthers grown to stigma	<i>Asclepiadaceæ</i> , 623
Anthers free from stigma.	
Corolla imbricated	<i>Gentianaceæ</i> , 612
Corolla valvate	<i>Loganiaceæ</i> , 602
Corolla contorted	<i>Apocynaceæ</i> , 59
Flowers unsymmetrical.	
Leaves with stipules	<i>Loganiaceæ</i> , 602
Leaves without stipules	<i>Stilbaceæ</i> , 607
Carpel single.	
Stigma with an indusium	<i>Brunoniaceæ</i> , 657
Stigma without an indusium.	
Style single.	
Fruit spuriously 2-celled	<i>Plantaginaceæ</i> , 642
Fruit 1-celled, 1-seeded	<i>Salvadoraceæ</i> , 652
Styles 5	<i>Plumbaginaceæ</i> , 640
** <i>Ovary superior. Flowers irregular.</i>	
‡ <i>Ovary 4-lobed</i>	<i>Lamiaceæ</i> , 659
‡‡ <i>Ovary undivided.</i>	
Carpel solitary	<i>Selaginaceæ</i> , 666
Carpels two.	
Fruit nucamentaceous, 4-celled.	
Radicle inferior	<i>Verbenaceæ</i> , 663
Radicle superior	<i>Myoporaceæ</i> , 665
Fruit nucamentaceous, 2-celled.	
Anthers 1-celled	<i>Selaginaceæ</i> , 666
Anthers 2-celled	<i>Stilbaceæ</i> , 607
Fruit capsular or succulent.	
Placentæ parietal.	
Seeds amygdaloid.	
Fruit succulent, hard-shelled, many-seeded	<i>Crescentiaceæ</i> , 673
Fruit bony or capsular, few-seeded	<i>Pedaliaceæ</i> , 669
Seeds not amygdaloid.	
Leafy.	
Seeds winged	<i>Bignoniaceæ</i> , 675
Seeds wingless	<i>Gesneraceæ</i> , 671
Scaly brown parasites	<i>Orobanchaceæ</i> , 609
Placentæ axile.	
Seeds albuminous	<i>Scrophulariaceæ</i> , 681
Seeds without albumen.	
Winged	<i>Bignoniaceæ</i> , 675
Wingless, attached to hard placental processes	<i>Acanthaceæ</i> , 678
Placentæ free, central	<i>Lentibulariaceæ</i> , 686
*** <i>Ovary inferior.</i>	
‡ <i>Carpels solitary.</i>	
Anthers syngenesious.	
Ovule pendulous	<i>Calyceraceæ</i> , 701
Ovule erect	<i>Asteraceæ</i> , 702
Anthers free.	
Carpel quite solitary	<i>Dipsacaceæ</i> , 699
Carpel with two additional abortive ones	<i>Valerianaceæ</i> , 697
‡‡ <i>Carpels more than one.</i>	
Anthers syngenesious	<i>Lobeliaceæ</i> , 692
Anthers free.	
Stamens only 2	<i>Columelliaceæ</i> , 759
Stamens more than 2.	
Anthers opening by pores	<i>Vacciniaceæ</i> , 757
Anthers opening by slits.	
Stigma naked.	
Pentandrous or tetrandrous	<i>Campanulaceæ</i> , 689
Polyandrous	<i>Belvisiaceæ</i> , 728
Gynandrous	<i>Stylidiaceæ</i> , 696
Stigma with an indusium	<i>Goodeniaceæ</i> , 694
Stigma without an indusium.	
Stipules absent. Stigmas definite. Stigmas naked.	
Leaves alternate	<i>Ebenaceæ</i> , 595
Leaves opposite, and whorled. Stem square, rough	<i>Galiaceæ</i> , 739
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*Delaun.* = Delaunay.  
*Dennst.* = Dennstedt.  
*Desc.* = Descourtilz.  
*Desf.* = Desfont. = Desfontaines.  
*Desm.* = Desmaz. = Desmazières.  
*Desp.* = Despretz.  
*Desv.* = Desvauz.  
*Dies.* = Diesing.  
*Dietr.* = Dietrich.  
*Dill.* = Dillen. = Dillenius.  
*Ditm.* = Dittm. = Dittmar.  
*Domb.* = Dombey.  
*Doug.* = Douglas.  
*Dryand.* = Dryander.  
*Duf.* = Dufour.  
*Duham.* = Duhamel.  
*Dum.* = Dumort. = Dumortier.  
*Dun.* = Dunal.  
*Dup. Th.* = Dup. Thouars. = Dupetit Thouars.  
*Dur.* = Durazz. = Durazzo.  
*Duv.* = Duval.

*E.* = End. = Endl. = Endlicher.  
*E. M.* = E. Mey. = Ernst Meyer.  
*E. Z.* = E. et Z. = Eck. et Zey. = Ecklon and Zeyher.  
*Eckl.* = Ecklon.  
*Ed. pr.* = Editio prior.  
*Ed. prim.* = Editio prima.  
*Ehr.* = Ehrenb. = Ehrenberg.  
*Ehrh.* = Ehrhart.  
*Ell.* = Elliott.  
*Engelm.* = Engelmann.  
*Eschue.* = Eschweiler.

*F.* = Fischer.  
*F. et M.* = F. et Mey. = Fischer and Meyer.  
*Fabric.* = Fabricius.  
*Falc.* = Falconer.  
*Feuill.* = Feuillé.  
*Fisch.* = Fischer.  
*Fl. Fl.* = Flora Fluminensis.  
*Fl. Mex.* = Flora Mexicana.  
*Fl. Wett.* = Flora Wetteravensis.  
*Flörk.* = Flörke.  
*Flot.* = Flotow.  
*Flugg.* = Flugge.  
*Forsk.* = Forskahl.  
*Forst.* = Forster.  
*Fr.* = Fries.  
*Fr. Syst.* = Fries Systema.  
*Fres.* = Fresen. = Fresenius.  
*Fröl.* = Frölich.  
*Frör.* = Froriep.  
*Fürr.* = Füllrohr.

*G. B.* = George Bentham.  
*G. D.* = G. Don. = George Don.  
*Gaill.* = Gaillon.  
*Gard.* = Gardn. = Gardner.  
*Gärtn.* = Gärtner.  
*Gaud.* = Gaudich. = Gaudichaud.  
*Gawl.* = Gawler.  
*Ging.* = De Gingins.  
*Ginn.* = Ginnanni.  
*Gill.* = Gillies.  
*Gled.* = Gleditsch.  
*Gmel.* = Gmelin.  
*Gom.* = Gomez.  
*Grah.* = Graham.  
*Gratel.* = Grateloup.  
*Gren.* = Grenier.  
*Grev.* = Greville.  
*Gries.* = Gris. = Griseb. = Grisebach.  
*Griff.* = Griffith.  
*Gron.* = Gronov. = Gronovius.  
*Guett.* = Guettard.  
*Guill.* = Guillem. = Guillemin.  
*Guill. et P.* = Guillemin and Perrotet.  
*Gusson.* = Gussone.

*H.* = Humb. = Humboldt.  
*H. B. K.* = Humboldt, Bonpland, and Kunth.  
*H. et A.* = Hooker and Arnott.  
*H. et B.* = H. et Bonpl. = Humboldt and Bonpland.  
*H. et G.* = Hooker and Greville.

*H. et J.* = Hombron and Jacquinot.  
*Hall.* = Haller.  
*Ham.* = Hamilt. = Hamilton.  
*Hartm.* = Hartmann.  
*Harv.* = Harvey.  
*Hass.* = Hassall.  
*Hasslq.* = Hasselquist.  
*Hassk.* = Hasskart.  
*Haw.* = Haworth.  
*Hayn.* = Hayne.  
*Hedw.* = Hedwig.  
*Heist.* = Heister.  
*Hellen.* = Hellenius.  
*Herb.* = Herbert.  
*Herit.* = L'Heritier.  
*Hernand.* = Hernandez.  
*Hfsg.* = Hfsgg. = Hoffmannsseg.  
*Hochs.* = Hochst. = Hochstetter.  
*Hoffm.* = Hoffmann.  
*Hon. Bell.* = Honorius Belli.  
*Hook.* = Hooker.  
*Hook. et Arn.* = Hooker and Arnott.  
*Hook. f.* = Hooker the younger.  
*Hopp.* = Hoppe.  
*Hor.* = Horan. = Horaninose.  
*Hork.* = Horkel.  
*Horn.* = Hornem. = Hornemann.  
*Hornsch.* = Hornschuch.  
*Hort. Hsp.* = Hortus Hispanicus.  
*Hort.* = Hortorum.  
*Houst.* = Houston.  
*Houtt.* = Houtteyn.  
*Hskl.* = Hasskart.  
*Hst.* = Hochstetter.  
*Hub.* = Hubert.  
*Huds.* = Hudson.  
*Hug.* = Hugel.

*Isn.* = Isnard.

*J.* = Jussieu.  
*J. Ag.* = J. Agth. = Agardh the younger.  
*J. J. B.* = J. J. Bennett.  
*J. Sm.* = John Smith.  
*J. St. Hil.* = Jaume St. Hilaire.  
*J. W. Schm.* = J. W. Schmidt.  
*Jacq.* = Jacquin.  
*Jaub.* = Jaubert.  
*Jaub. et Spach.* = Jaubert and Spach.  
*Jon.* = Jones.  
*Jungb.* = Junghuns.  
*Juss.* = Jussieu.

*K. Mull.* = Karl Muller.  
*K. et H.* = Kuhl et H. = Kuhl and Hasselt.  
*Ka.* = Kar. = Karel. = Kardin.  
*Kämpf.* = Kämpfer.  
*Kaulf.* = Kaulfuss.  
*Kch.* = Koch.  
*Kl.* = Klsh. = Klotzsch.  
*Kel.* = Koler.  
*Kon.* = Konig.  
*Korth.* = Korthals.  
*Kostel.* = Kostelezsky.  
*Kth.* = Kunth.  
*Ktz.* = Ktzing. = Kutz. = Kützing.  
*Kze.* = Kunze.

*L.* = Linnæus.  
*L. C. R.* = L. C. Rich. = Louis Claude Richard.  
*L. et Z.* = Lehmann and Zeyher.  
*L. et Lex.* = Llav. and Lexarsa.  
*L. f.* = Linnæus the younger.  
*L. et O.* = Lk. et O. = Link and Otto.  
*Labill.* = Lab. = Labillardière.  
*Lag.* = Lagasc. = Lagasca.  
*Lallem.* = Lallemant.  
*Lam.* = Lamark.  
*Lamb.* = Lambert.  
*Lamx.* = Lamouroux.  
*Lapeyr.* = Lapeyrouse.  
*Lavrad.* = Lavrado.  
*Laus.* = Lauson.  
*Leandr.* = Leandro da Sacramento.  
*Ledeb.* = Ledebour.



[illegible][illegible][illegible]

*Orl.*—*Orlog*. = *Or*

*P.* = *P.*  
*P.* = *P.*  
**P. Br.** = Patrick B.  
*P.* = *P.*  
*P.* = *P.*  
*P.* = *P.*  
*P.* = *P.*  
**Parl.** — Parl. = Parlat



*Son.*—*Sonn.*—*Sonner.*—*Sonnerat.*

*Sp.*—*Spr.*—*Spreng.*—*Sprengel.*

*Sparrm.*—*Sparrmann.*

*Splltg.*—*Splltgerber.*

*St. Hil.*—*Auguste de Saint Hilaire.*

*St. et H.*—*Steudel and Hochstetter.*

*Stack.*—*Stackh.*—*Stackhouse.*

*Stadtm.*—*Stadtman.*

*Ste.*—*Steven.*

*Steinh.*—*Steinheil.*

*Steph.*—*Stephan.*

*Sternb.*—*Sternberg.*

*Steud.*—*Steudel.*

*Stev.*—*Steven.*

*Sw.*—*Swz.*—*Swartz.*

*T.*—*Tournefort.*

*T. et A. G.*—*T. et Gr.*—*Torrey and Asa Gray.*

*Tagliab.*—*Tagliabue.*

*Targ.*—*Targioni Tozzetti.*

*Tayl.*—*Taylor.*

*Ten.*—*Tenor.*—*Tenore.*

*Th.*—*Thunb.*—*Thunberg.*

*Thienem.*—*Thienemann.*

*Thonn. et Schum.*—*Thonning and Schumacher.*

*Thou.*—*Thouars.*

*Torr.*—*Torrey.*

*Torr. et Gr.*—*Torrey and Gray.*

*Tourn.*—*Tournef.*—*Tournefort.*

*Tratt.*—*Trattin.*—*Trattinnick.*

*Traut.*—*Trautvetter.*

*Trev.*—*Treviranus.*

*Trin.*—*Trinius.*

*Trotzk.*—*Trotzky.*

*Trttv.*—*Trautvetter.*

*Tul.*—*Tulasne.*

*Turcz.*—*Turczaninow.*

*Turp.*—*Turpin.*

*Tuss.*—*Tussac.*

*Vaill.*—*Vaillant.*

*Vand.*—*Vandelli.*

*Vauch.*—*Vaucher.*

*Velloz.*—*Vell.*—*Vellozo.*

*Vent.*—*Ventenat.*

*Vill.*—*Villars.*

*Vis.*—*Visian.*—*Visiani.*

*Vittad.*—*Vitt.*—*Vittadini.*

*Viv.*—*Viviani.*

*Vog.*—*Vogel.*

*W.*—*Willdenow.*

*W. Arn.*—*W. et A.*—*Wight and Arnot.*

*W. H.*—*W. Herbert.*

*W. et Berth.*—*Webb and Berthelot.*

*W. et Gr.*—*Wilson and Greville.*

*Wahl.*—*Wahlenb.*—*Wahlenberg.*

*Wall.*—*Wallich.*

*Wallr.*—*Wallroth.*

*Walp.*—*Walpers.*

*Walt.*—*Walter.*

*Wats.*—*Watson.*

*Web. et M.*—*Weber and Mohr.*

*Weig.*—*Weigel.*

*Wendl.*—*Wendland.*

*Wigg.*—*Wiggers.*

*Wikstr.*—*Wikstrom.*

*Willd.*—*Willdenow.*

*Wils.*—*Wilson.*

*Wimm.*—*Wimmer.*

*Wulf.*—*Wulfen.*

*Z.*—*Zuccarini.*

*Zahlbr.*—*Zahlbruckner.*

*Zanard.*—*Zanardini.*

*Zenk.*—*Zenker.*

*Zippel.*—*Zipp.*—*Zippelius.*

*Zollik.*—*Zollikofer.*

*Zucc.*—*Zuccarini.*



















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